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The Committee on Research and Relations of the National Wholesale Druggists' Association Announces the Completion of a Medicinal Plant Map of the United States of America for Use as a Window Background by Pharmacists during Pharmacy Week, October 9th to 16th.

Vol. XXI, No. 8 AUGUST, 1932

JOURNAL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION

TRADE MARK

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THE 80th ANNUAL MEETING OF THE AMERICAN PHARMACEUTICAL ASSOCIATION WILL BE HELD IN TORONTO, CANADA, IN 1932—August 22nd–27th, Royal York Hotel, Headquarters, R. B. J. Stanbury, 43 Victoria St., Toronto 2, Canada, Local Secretary.

The 1932 Meetings of the American Association of Colleges of Pharmacy, the National Association of Boards of Pharmacy, Conference of Pharmaceutical Association Secretaries, of the Pharmaceutical Law Enforcement Officials and the Plant Science Seminar will also be held in Toronto.

Entered as second-class Matter, January 23, 1917, at the Post Office at Easton, Pa., under the Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in section 1103. Act of October 3, 1917; authorized July 10, 1918.

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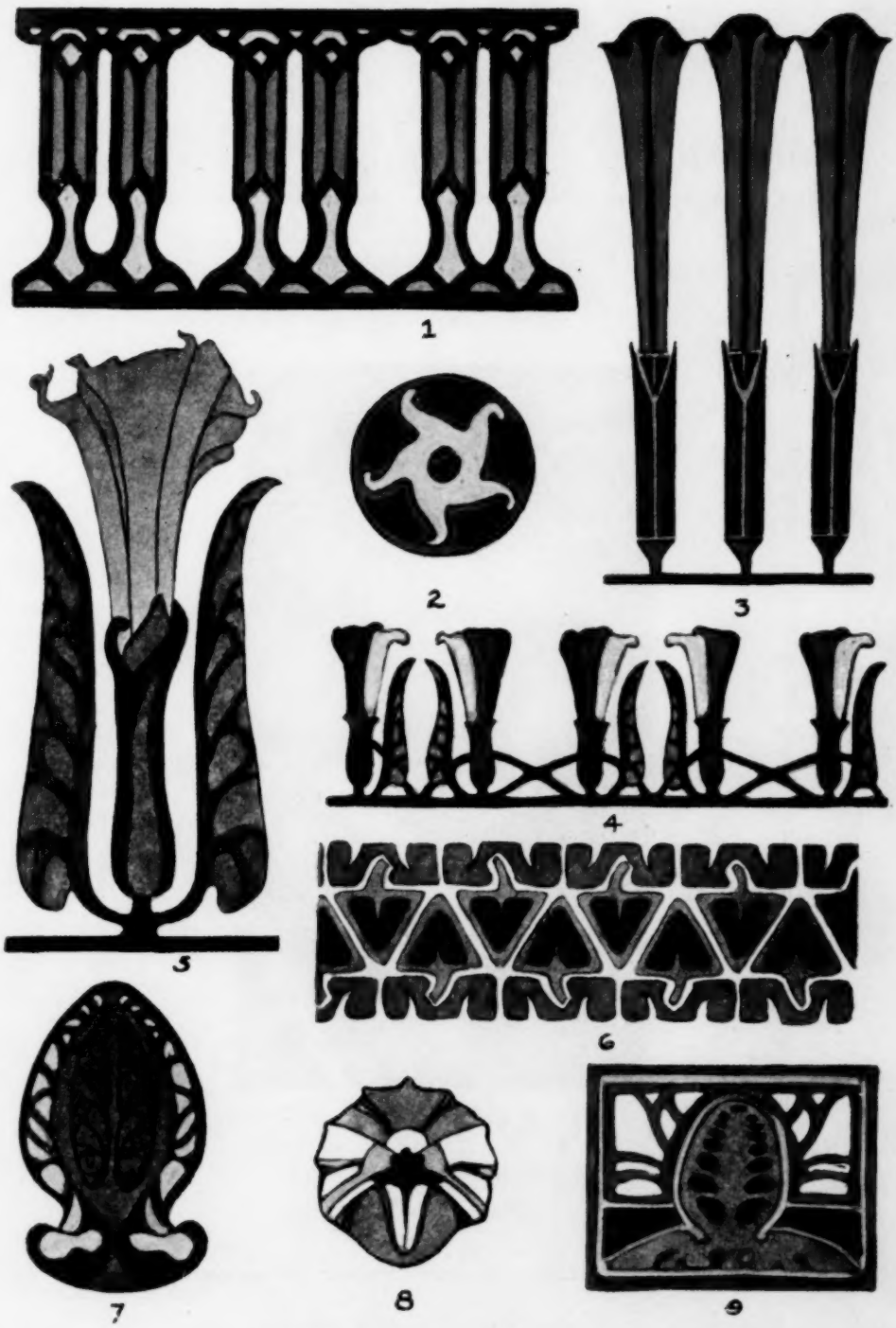
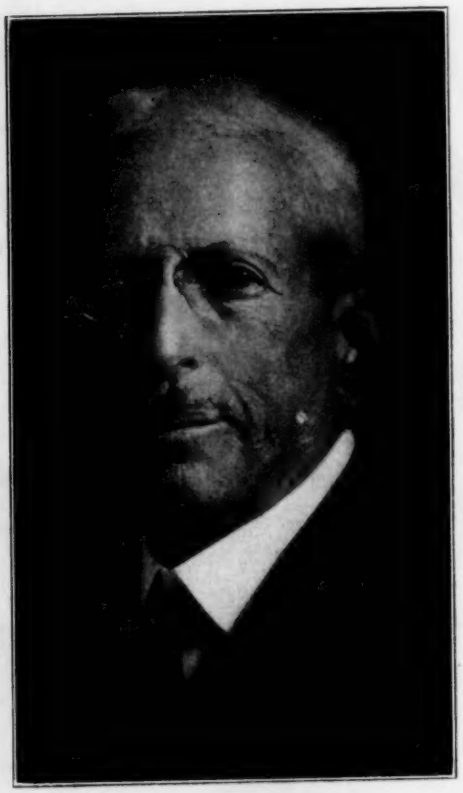


DRUG STORE DECORATIONS.

Decorations derived from several species of *Datura*, raised in the Wisconsin Pharmaceutical Experiment Station garden by pupils of the Madison High School under the direction of Miss Bernice Oehler.



GEORGE D. ROSENGARTEN.

JOURNAL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION

VOL. XXI AUGUST, 1932 No. 8

GEORGE DAVID ROSENGARTEN.

The subject of this brief sketch—Dr. George D. Rosengarten—a life member of the AMERICAN PHARMACEUTICAL ASSOCIATION, was born in Philadelphia, February 12, 1869—the son of Harry B. and Clara J. (née Knorr) Rosengarten. He received his early education in Dr. Faries' Classical Institute, and later, in 1884, studied under Prof. Henry Trimble at the Philadelphia College of Pharmacy. Thereafter, he entered the University of Pennsylvania in 1886, and received his B.Sc. degree in 1890. His studies were continued at the University of Jena, where he earned his Ph.D. degree, in 1892. In 1927, he was honored with the Sc.D. degree by the University of Pennsylvania.

During his University years he was treasurer during the Freshman year and was honor man in both terms of the Freshman and Sophomore years and has been class president from 1918 to date.

Dr. Rosengarten entered business with Rosengarten and Sons, Chemical Manufacturers, in 1892, and was elected vice-president of the corporation in 1901 and served in the same official capacity after the consolidation of Powers, Weightman, Rosengarten, Inc., from 1905 to 1927 and as director of Merck & Co., Inc., 1927–1929 (now retired).

He is a director of the Girard National Bank and of the Philadelphia National Bank, Philadelphia. Among his many affiliations with associations, clubs and societies are the following: American Institute of Chemical Engineers, of which he was president 1915–1917; American Chemical Society, former chairman of its Industrial Division, Councilor-at-Large, and its president in 1927, member of its Executive Committee; member of the Electro-Chemical Society; American Institute of Mining Engineers, Franklin Institute and of its board of managers to date; Society of Chemical Industry, German Chemical Society.

He is a member of the Historical Society of Pennsylvania, Academy of Fine Arts, Horticultural Society, Zoölogical Society, of Philadelphia; member of the

American Philosophical Society, fellow of the American Association for the Advancement of Sciences, and American Academy of Political and Social Science.

Dr. Rosengarten was a member of the Revision Committee of the U. S. Pharmacopœia IX and X, and chairman of the sub-committee of Organic Chemicals.

Mr. and Mrs. Rosengarten (née Susan Elizabeth Wright) were married in 1895; their home is in Malvern, Pa.

GREETINGS TO: THE AMERICAN PHARMACEUTICAL ASSOCIATION, THE CANADIAN PHARMACEUTICAL ASSOCIATION, THE ONTARIO RETAIL DRUGGISTS' ASSOCIATION.

WILLIAM J. STEWART.
Mayor of the City of Toronto.

"IT was with great pleasure that I learned that a joint Convention of your Associations will be held in Toronto in August next, and I assure the members of a right hearty welcome to our City on that occasion.

We will be especially glad to welcome the pharmacists of the United States, who, I understand, are meeting here for the first time since 1877. We entertain a very warm feeling for the citizens of the neighboring Republic, and are always glad to have them visit our City.

We readily recognize the high calibre of the members who compose these organizations, and we will count it an honour to have such a fine body of business and professional men in our midst.

We trust that a large number of your members will take advantage of this opportunity to come to Toronto, which offers every facility for a happy and interesting holiday. During August our City is at its best. Here is to be found every opportunity for summer sports and amusements, in range and variety to suit every taste. Well-paved highways lead to many summer resorts, including Muskoka, the ideal playground of our Province.

It is my sincere hope that it will be my good fortune to personally greet your members."

Mayor.

SURVEY SHOWS HEALTH OF NATION GENERALLY BETTER THAN YEAR AGO.

A survey of the effect of economic conditions upon the health of the Nation, based on statistical indices covering the first half of 1932 and questionnaires sent to state and local health officers, indicates that the state of the public health is generally favorable, although it is impossible to predict whether the record made thus far can be expected to continue through the depression, according to information made available July 28th by the Public Health Service.

EDITORIAL

E. G. EBERLE, EDITOR 10 West Chase Street, BALTIMORE, MD.

THE DESIGNS FOR PHARMACY FIXTURES SHOULD BE REPRESENTATIVE OF PHARMACY.

THE Show Globe has been brought back into pharmacy and several state pharmaceutical associations have resolved that pharmacies, the windows and the interiors, shall be indicative of pharmacy. Pharmacy week has done a great deal in the development of the pharmacy window; the exhibits at national and state medical and pharmacy meetings have brought forward the professional importance of pharmacy and it remains for hospital pharmacies to place a greater emphasis on this fact. We have had great hospital pharmacists whose work received the recognition of medical co-workers, hospital officials and citizens at large, citing as examples of widely separated periods—John Morgan and Charles Rice.

Some of the recently equipped pharmacies have been designed with the professional forethought, and during the past year or two the JOURNAL has shown a number of European and American pharmacies with the purpose of stimulating the indicated viewpoint.

An article of the JOURNAL for April 1917, page 375, is repeated in part. The suggestion for the work was made by Dr. Edward Kremers and carried on by Miss Bernice Oehler, then teacher of art at the Madison High School. At that time[1] a large number of species and varieties of *Datura* were in blossom and had already produced fruit; leaf and stem, flower bud, full-blown flower and capsule, all lent themselves admirably to the problem. *The School-Arts Magazine* prepared an illustrated article on the subject and stated that "the result was most striking;" other comment is embodied in the following, on the water-color exhibit at the University Exposition the following spring: "If juniors in a high school can produce such results what may be expected of the mature artist?" The possibilities in this direction for drug store decorative art are well-nigh unlimited. The adoption of such designs in planning new stores would result in something distinctive, and would tend, as much as any one thing, to lend a more professional aspect to the pharmacist's place of business. Of the illustrations *The School-Arts Magazine* said "they exhibited unusually fine coloring, all lost in the half-tone reproduction" (see page 745, April Journal).

Every drug store and every pharmacy should be designed according to location, but a more or less general plan will fit a large number of locations and it would be well if, in the study of store fixtures, the possibilities in pharmacy decoration might be brought to the attention of architects and fixture people; changes are made slowly.

As the pharmacy reflects the pharmacist's individuality, so his ideas will differ from those of his co-workers, and also his viewpoint relative to stock, business conduct, arrangement of the pharmacy and its equipment—let it differ from other business establishments and be distinctive—representative as far as possible of pharmacy.

[1] Late summer of 1914.

PAST AND PRESENT.

WE WILL have with us at the meeting in Toronto, the presidents of the British Pharmaceutical Society and Pharmaceutical Conference. In 1883 President Michael Carteighe, of the British Pharmaceutical Society, attended the meeting of the AMERICAN PHARMACEUTICAL ASSOCIATION convened in Chicago. He had come not only as a delegate to the A. PH. A., but also had been delegated to bring to Prof. John M. Maisch the Hanbury Medal, which had been awarded to him. The Council of the Pharmaceutical Society was also represented by Mr. Martin of Newcastle and Mr. Martindale of London.

Mr. Carteighe, in his address, said that "a man who complains of his pharmacy and of his fate I have always found to be a man who does not keep abreast of the work that is going on. The man who considers that education is not a power and that it does not mean money, I hold that it does and the man who would carry on his business as an ordinary trade, and who would, at the same time demand from the public professional remuneration for the things which he sells is not likely to get the respect of the public....." "It is necessary and essential that every pharmacist should know something of the methods by which the *weapons* he uses in the cure of disease and under the advice of the physician are constructed, and able to ascertain by proper chemical processes that they are what they profess to be.

The late Prof. Peter W. Bedford presided at the 1882 meeting of the AMERICAN PHARMACEUTICAL ASSOCIATION, held at Niagara Falls on September 12, 1882; he was *Professor Emeritus* of the College of Pharmacy of the City of New York and editor and founder of the *Pharmaceutical Record*. In earlier years he was associated with the late Ewen McIntyre; later, he opened a retail pharmacy, then entered the wholesale and manufacturing business.

In 1873 he was elected professor of pharmacy in the New York College of Pharmacy. He was one of the organizers of the New York State Pharmaceutical Association, and for a time member of the New York Board of Pharmacy, always tirelessly active in various divisions of pharmacy until his demise.

Several years ago, pharmacists of this country were honored by a visit of Sir William S. Glyn-Jones, who had come to this country to study the drug field and assist the Canadian pharmacists in devising plans for regulating the sales of proprietary medicines. He was welcomed by the pharmacists of the United States and of Canada and gained their friendship and regard, and they learned to know him as one thoroughly posted on all matters that pertain to the drug business and pharmacy, and stimulated by the desire to be helpful.

The AMERICAN PHARMACEUTICAL ASSOCIATION met in Toronto in 1877 and in Montreal in 1896. It was honored by two presidents from Canada, namely, William Saunders of London, Ontario, and Joseph E. Morrison of Montreal. At these meetings the AMERICAN PHARMACEUTICAL ASSOCIATION was not a visitor in the sense that it is this year, for at that time the organization included the pharmacists of Canada, and feels honored that quite a number of Canadian pharmacists are members of the body, and they receive the same cordial welcome accorded them before the organization of the Canadian Pharmaceutical Association, now congratulated on its twenty-five years of useful service for pharmacy.—To its members and to those of Great Britain and pharmacists of all other countries hearty greetings and wishes for continued success are extended.

PUBLICITY AND COÖPERATION OF PROFESSIONS.

GOOD progress has been made in advertising the pharmacy, in giving publicity to the U. S. Pharmacopœia and National Formulary, in making the officials known to physicians, locally, and at meetings of medical associations. Lately, the same plan has been followed in bringing dentists and pharmacists into closer professional contact and thereby creating and developing the opportunities for serving the public.—An illustrated paper on the subject is part of the Toronto program. The local meetings of members of these professional bodies are most helpful to all of them, because they create an acquaintance and a relationship which is of far-reaching influence. The hopeful sign is that the meetings have resulted not only in a better understanding, but in expressions of satisfaction by those in attendance—that they have profited by the discussions—thereby public health is promoted and the public will benefit.

Publicity for pharmacy at the Chicago World's Fair—"A Century of Progress"—indicates that the directors of this great undertaking have studied the inter-relationship of the medical group, with the result that pharmacy has been assigned like space as allotted to the other professions for telling of its history and depicting its activities.

It must be admitted that pharmacy has been somewhat over-shadowed by an over-emphasis of the commercial features in some drug stores; as a result, the public has not gained the significance of the professional value of pharmacy, for public opinion is shaped by publicity—pharmacy can be denounced or its importance pronounced—made known by printed word and by the appearance and activities of the drug store. Often the public is advised by those who depend on distribution of their products that the patrons should exercise care in their purchases—indirectly, an insinuation that unless they do so inferior articles will be foisted upon them. Every pharmacist owes it to himself and to pharmacy to aid in acquainting the public with the service rendered by pharmacy and its importance. Every opportunity that will lend itself to the purpose should be utilized to acquaint the public with the part pharmacy has in public health service, by informing the people that pharmacists have been the chief exponents of regulations applying to the profession, for its protection against misuse of drugs, and seriously engaged in the development of a materia medica which enables medical men to make the best use of it. The earnestness of this coöperation is shown by the growing interest in the discussions and exhibits to the end that therapy may be improved; that among the drugs there are agents which can be employed by physicians with confidence and reasonable expectancy of results. Pharmacists are concerned, and their part in the work is not only to supply remedial agents, but also to see that preparations are supplied which represent them most effectively. Dr. Lewellys F. Barker has stated the physician's duty before the Section on Pharmacology and Therapeutics of the American Medical Association in these words: "In the management of patients and in the treatment of their diseases it is our duty as physicians to see to it that we do not neglect to make application of any of the agents at our disposal that may reasonably be expected to help." . . . "Pharmacotherapy is seen at its best when, through the use of a drug, the cause of a disease is removed or rendered harmless (etiologic pharmacotherapy) before the patient

has sustained irreparable injuries. The organism can then right itself, so that its activities can resume the normal or physiologic course."

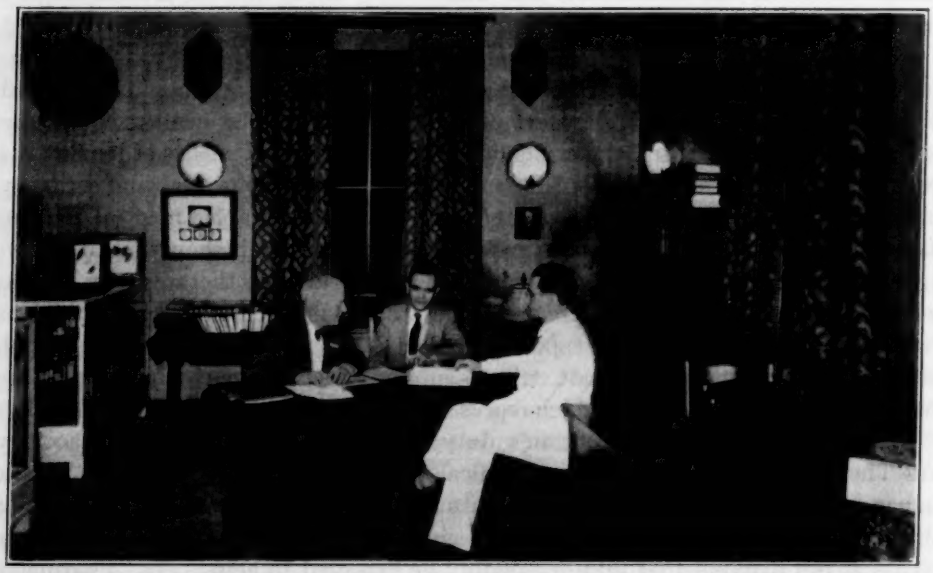
To the end that pharmacy may be assigned its proper place the public should be informed, and the Government in its several divisions should make full use and give due credit and recognition to pharmacy and pharmacists; this requires an active part by pharmacists in giving pharmacy the right kind of publicity.

Several years ago Governor Ritchie said—"It is Public Health contact that makes the pharmacists' activities of great significance for the state," and because of this he took a keen and very active interest in it.

President Hoover said: "On the development of drugs and their uses depend to a considerable degree the health and welfare of the people of the world. Daily our laboratories are engaged in the pursuit of newer knowledge which will make constantly more effective the unending combat against illness and disease. The pharmacists of our country are indispensable allies of the physicians. It is fitting, therefore, that each year we should formally acknowledge our indebtedness to them. I am glad to extend to the pharmacists of the nation the good wishes of all our people."

Last month, in the Nation's Capital, a progressive step was taken in the headquarters project—an expression of the faith of pharmacists in pharmacy; this month, in Toronto, there will be an exemplification of international coöperation among pharmacists in behalf of the service that pharmacy renders.

Let us do our part in making the headquarters of greatest usefulness by giving it financial and professional support; in acquainting the public with the service of pharmacy; share in public health promotion; protect the good name of pharmacy, evidence our belief in it and its mission!



The Library at Wisconsin Pharmaceutical Association Exhibit.—Seated back of table: Left, President H. L. Emmerich and E. G. Raeuber; front, Anton Hogstad, Jr. On the wall, near the book case, is a photograph of Dr. Edward Kremers.

SCIENTIFIC SECTION

THE STRYCHNINE-BRUCINE RATIO OF NUX VOMICA AND THE RELATIVE POTENCY OF THESE ALKALOIDS.

BY ROBERT W. MORRISON AND A. RICHARD BLISS, JR.

(*Continued from page 658, July number,* JOUR. A. PH. A.)

RESULTS AND OBSERVATIONS.

A.—CHEMICAL.

The tables which follow are arranged so that the results obtained with each sample of crude drug are grouped with those obtained with the fluidextract and the tincture manufactured from that particular powdered sample of Nux Vomica.

Three assays were carried out on each sample, and on the tincture and the fluidextract made therefrom. The weight of total alkaloids was determined first, the brucine then destroyed by oxidation, and the weight of brucine calculated by subtracting the weight of the residue (the strychnine) from that of the total alkaloids.

The percentages found in the tincture tables have been expressed in terms of amounts representing equivalent quantities to the powdered drug and fluidextract. This was done in order that the values might be compared more readily.

TABLE I.—SAMPLE NO. 1 POWDERED NUX VOMICA, FLUIDEXTRACT, TINCTURE.

Assay of	Gm. or Cc. Sample.	Gm. Total Alk.	Gm. Strych.	Gm. Bruc.	% Tot. Alk.	% Strych.	% Bruc.	Ratio S–B.
Drug	9.8064	0.2160	0.0922	0.1238	2.200	0.939	1.261	43–57
Drug	10.0519	0.2180	0.0950	0.1230	2.170	0.940	1.230	43–57
Drug	9.5503	0.2100	0.0894	0.1206	2.190	0.932	1.258	43–57
Fldext.	10	0.2311	0.0970	0.1341	2.311	0.970	1.391	42–58
Fldext.	10	0.2264	0.0971	0.1293	2.264	0.971	1.293	43–57
Fldext.	10	0.2283	0.0989	0.1294	2.283	0.989	1.294	43–57
Tr.	50	0.1118	0.0465	0.0653	2.230	0.926	1.304	42–58
Tr.	50	0.1139	0.0486	0.0653	2.271	0.968	1.303	43–57
Tr.	50	0.1119	0.0466	0.0653	2.230	0.928	1.302	42–58

The average ratio of strychnine to brucine in this crude drug and its galenical preparations was practically uniform, *viz.*, 43 parts of strychnine to 57 parts of brucine.

This sample of drug was not labeled U. S. P., and the results of the assays indicate that it is not up to official standards.

TABLE II.—SAMPLE NO. 2 POWDERED NUX VOMICA, FLUIDEXTRACT, TINCTURE.

Assay of	Gm. or Cc. Sample.	Gm. Total Alk.	Gm. Strych.	Gm. Bruc.	% Tot. Alk.	% Strych.	% Bruc.	Ratio S–B.
Drug	10.5942	0.2228	0.0992	0.1236	2.103	0.936	1.167	45–55
Drug	11.3735	0.2440	0.1090	0.1390	2.150	0.960	1.190	45–55
Drug	10.8728	0.2356	0.1062	0.1250	2.161	0.975	1.186	45–55
Fldext.	10	0.2149	0.0963	0.1186	2.149	0.963	1.186	45–55
Fldext.	10	0.2125	0.0933	0.1193	2.125	0.933	1.193	44–56
Fldext.	10	0.2104	0.0948	0.1156	2.104	0.948	1.156	45–55
Tr.	50	0.1093	0.0490	0.0603	2.186	0.981	1.205	45–55
Tr.	50	0.1075	0.0496	0.0579	2.150	0.973	1.177	45–55
Tr.	50	0.1098	0.0492	0.0606	2.186	0.983	1.203	45–55

The strychnine-brucine ratio was essentially the same throughout, *viz.*, 45 of strychnine to 55 of brucine in the powdered drug, the fluidextract and the tincture.

This sample, too, is below pharmacopœial requirements for total alkaloidal content.

TABLE III.—SAMPLE NO. 3 POWDERED NUX VOMICA, FLUIDEXTRACT, TINCTURE.

Assay of	Gm. or Cc. Sample.	Gm. Total Alk.	Gm. Strych.	Gm. Bruc.	% Alk.	% Strych.	% Bruc.	Ratio S-B.
Drug	10.9335	0.2690	0.1222	0.1468	2.461	1.120	1.341	46–54
Drug	10.3523	0.2570	0.1164	0.1406	2.483	1.131	1.352	46–54
Drug	10.5528	0.2538	0.1158	0.1380	2.412	1.101	1.311	46–54
Fldext.	10	0.2380	0.1105	0.1275	2.380	1.105	1.275	46–54
Fldext.	10	0.2376	0.1088	0.1288	2.376	1.088	1.288	46–54
Fldext.	10	0.2349	0.1070	0.1279	2.349	1.070	1.279	46–54
Tr.	50	0.1263	0.0580	0.0683	2.526	1.159	1.367	46–54
Tr.	50	0.1252	0.0571	0.0681	2.504	1.142	1.362	46–54
Tr.	50	0.1249	0.0574	0.0675	2.498	1.154	1.344	45–55

The ratio of strychnine to brucine in the tincture, the fluidextract and the powdered drug was 46 to 54.

TABLE IV.—SAMPLE NO. 4 POWDERED NUX VOMICA, FLUIDEXTRACT, TINCTURE.

Assay of	Gm. or Cc. Sample.	Gm. Total Alk.	Gm. Strych.	Gm. Bruc.	% Tot. Alk.	% Strych.	% Bruc.	Ratio S-B.
Drug	11.7569	0.2814	0.1358	0.1456	2.394	1.124	1.270	47–53
Drug	11.2453	0.2720	0.1332	0.1389	2.419	1.140	1.280	47–53
Drug	10.3632	0.2438	0.1134	0.1304	2.353	1.102	1.251	47–53
Fldext.	10	0.2490	0.1181	0.1309	2.490	1.181	1.309	47–53
Fldext.	10	0.2424	0.1142	0.1282	2.424	1.142	1.282	47–53
Fldext.	10	0.2446	0.1134	0.1312	2.446	1.134	1.312	47–53
Tr.	50	0.1227	0.0583	0.0644	2.454	1.168	1.286	47–53
Tr.	50	0.1190	0.0571	0.0619	2.380	1.142	1.238	47–53
Tr.	50	0.1227	0.0584	0.0643	2.454	1.167	1.287	47–53

This sample of powdered Nux Vomica is slightly below official specifications for total alkaloidal content, but the preparations made from it come up to official requirements.

The strychnine-brucine ratio was found to be 47 to 53 in the powdered drug, the fluidextract and the tincture.

TABLE V.—SAMPLE NO. 5, POWDERED NUX VOMICA, FLUIDEXTRACT, TINCTURE.

Assay of	Gm. or Cc. Sample.	Gm. Total Alk.	Gm. Strych.	Gm. Bruc.	% Tot. Alk.	% Strych.	% Bruc.	Ratio S-B.
Drug	11.5633	0.2350	0.1144	0.1206	2.03	0.989	1.044	49–51
Drug	11.9918	0.2400	0.1164	0.1236	2.00	0.970	1.030	49–51
Drug	9.8784	0.1980	0.0972	0.1008	2.00	0.986	1.014	49–51
Fldext.	10	0.1976	0.0978	0.0998	1.976	0.978	0.998	49–51
Fldext.	10	0.1967	0.0959	0.1008	1.967	0.959	1.008	49–51
Fldext.	10	0.1961	0.0953	0.1008	1.961	0.953	1.008	49–51
Tr.	50	0.0992	0.0485	0.0507	1.984	0.916	1.068	49–51
Tr.	50	0.0967	0.0470	0.0497	1.934	0.934	1.095	49–51
Tr.	50	0.0991	0.0486	0.0505	1.982	0.969	1.013	49–51

The ratio of strychnine to brucine was constant for the powdered drug, the fluidextract and the tincture; *viz.*, 49 parts of strychnine to 51 parts of brucine.

This sample of crude drug, although bearing a label stating that it was in accord with the U. S. P. requirements for total alkaloids, assayed below the official requirements. The same was true of the fluidextract and tincture.

TABLE VI.—SAMPLE NO. 6, POWDERED NUX VOMICA, FLUIDEXTRACT, TINCTURE.

Assay of	Gm. or Cc. Sample.	Gm. Total Alk.	Gm. Strych.	Gm. Bruc.	% Tot. Alk.	% Strych.	% Bruc.	Ratio S–B.
Drug	11.6149	0.2756	0.1142	0.1614	2.373	0.985	1.338	41–59
Drug	11.6895	0.2758	0.1122	0.1636	2.371	0.965	1.406	41–59
Drug	10.6839	0.2534	0.1036	0.1498	2.372	0.968	1.404	41–59
Tr.	50	0.1210	0.0505	0.0705	2.420	1.001	1.419	41–59
Tr.	50	0.1210	0.0503	0.0707	2.420	1.006	1.414	41–59
Tr.	50	0.1203	0.0505	0.0698	2.406	1.010	1.396	41–59

The ratio of strychnine to brucine was constant in both the powder and the tincture, *viz.*, 41 parts of strychnine to 59 parts of brucine.

The powdered drug is a little below U. S. P. specifications, but the tincture assays within the pharmacopœial limits.

TABLE VII.—SAMPLE NO. 7, POWDERED NUX VOMICA AND TINCTURE.

Assay of	Gm. or Cc. Sample.	Gm. Total Alk.	Gm. Strych.	Gm. Bruc.	% Tot. Alk.	% Strych.	% Bruc.	Ratio S–B.
Drug	12.5081	0.2982	0.1280	0.1702	2.384	1.023	1.361	43–57
Drug	10.4704	0.2478	0.1080	0.1439	2.386	1.039	1.347	43–57
Drug	9.9832	0.2374	0.1045	0.1329	2.378	1.047	1.331	44–56
Tr.	50	0.1176	0.0496	0.0680	2.352	0.992	1.360	43–57
Tr.	50	0.1193	0.0520	0.0673	2.386	1.040	1.346	43–57
Tr.	50	0.1175	0.0511	0.0664	2.350	1.022	1.328	43–57

The ratio of strychnine to brucine was 43 *plus* strychnine to 57 *minus* brucine in both powder and tincture. Only a tincture was prepared.

This sample of powdered drug and its tincture are slightly below pharmacopœial requirements.

TABLE VIII.—SAMPLE NO. 8, POWDERED NUX VOMICA, TINCTURE.

Assay of	Gm. or Cc. Sample.	Gm. Total Alk.	Gm. Strych.	Gm. Bruc.	% Tot. Alk.	% Strych.	% Bruc.	Ratio S–B.
Drug	11.1093	0.2532	0.1360	0.1172	2.279	1.224	1.055	54–46
Drug	13.0740	0.2950	0.1598	0.1352	2.256	1.222	1.034	54–46
Drug	11.3560	0.2564	0.1384	0.1180	2.258	1.219	1.039	54–46
Tr.	50	0.1167	0.0652	0.0515	2.334	1.384	0.950	55–45
Tr.	50	0.1162	0.0621	0.0541	2.324	1.243	1.081	54–46
Tr.	50	0.1159	0.0623	0.0536	2.318	1.249	1.069	54–46

The ratio of strychnine to brucine in both powdered drug and tincture was 54 to 46.

Although this sample of crude drug bore a U. S. P. label, both the tincture and powdered drug are well below official requirements.

Seven of the eight samples assayed less strychnine than brucine, varying from a low strychnine ratio of 41 to 59 brucine, to a high ratio of 54 strychnine to 46 brucine. Only one sample assayed more strychnine than brucine, this ratio being 54 strychnine to 46 brucine.

B. PHARMACOLOGIC.

In order to obtain doses which would cause convulsions in approximately the same length of time, several series of preliminary observations on each specie of animal employed in the study were made.

TABLE IX.—FROGS—STRYCHNINE.

The frogs were injected with a solution of Strychnine Sulphate, using eight milligrams per kilogram-body-weight.

Frog No.	Wt. in Gm.	Minutes to Hypersensitivity.	Minutes to Convulsions.
1	18.1	6	9
2	23.6	4	7
3	18.4	4	10
4	18.2	4	6
5	21.3	4	6
Averages:		$4^{2}/_{5}$	$7^{3}/_{5}$

TABLE X.—FROGS—BRUCINE.

The frogs were injected with a solution of Brucine Sulphate, using eighty times the dose of Strychnine Sulphate or 640 milligrams per kilogram-body-weight.

Frog No.	Wt. in Gm.	Minutes to Hypersensitivity.	Minutes to Convulsions.
1	17.1	3	6
2	15.9	4	7
3	13.4	3	5
4	17.3	3	6
5	21.0	3	8
Averages:		$3^{1}/_{5}$	$6^{2}/_{5}$

The relative potency of strychnine and brucine in the frog is *one to eighty.*

TABLE XI.—RABBITS—STRYCHNINE.

The rabbits were injected subcutaneously in the abdominal region with a solution of Strychnine Sulphate, using 0.5 milligram per kilogram-body-weight.

Rabbit No.	Wt. in Kilograms.	Minutes to Hypersensitivity.	Minutes to Convulsions.
1	1.42	13	18
2	1.91	12	19
3	1.36	12	18
4	1.36	11	17
5	1.60	14	16
6	1.25	12	18
Averages:		$12^{1}/_{4}$	$17^{2}/_{3}$

TABLE XII.—RABBITS—BRUCINE.

The rabbits were injected subcutaneously as in Table III, with a solution of Brucine Sulphate, using thirty-seven times the dose of Strychnine Sulphate or 18.5 milligrams per kilogram-body-weight.

Rabbit No.	Wt. in Kilograms.	Minutes to Hypersensitivity.	Minutes to Convulsions.
1	1.42	13	19
2	1.30	12	18
3	1.53	12	16
4	1.54	12	16
5	0.91	10	15
6	1.96	12	16
Averages:		12	$16^{2}/_{3}$

The relative toxicity of strychnine to brucine in the rabbit, is therefore, *one to thirty-seven.*

TABLE XIII.—DOGS—STRYCHNINE.

The dogs were injected subcutaneously with a solution of Strychnine Sulphate, using 0.3 milligram per kilogram-body-weight.

Dog. No.	Wt. in Kilograms.	Minutes to Hypersensitivity.	Minutes to Convulsions.
1	3.80	12	13
2	9.00	9	10
3	2.60	10	13
4	5.00	10	14
5	7.03	11	15
Averages:		$10^{2}/_{5}$	13

TABLE XIV.—DOGS—BRUCINE.

The dogs were injected subcutaneously with a solution of Brucine Sulphate, using forty-five times the dose of Strychnine Sulphate or 13.5 milligram per kilogram-body-weight.

Dog No.	Wt. in Kilograms.	Minutes to Hypersensitivity.	Minutes to Convulsions.
1	4.40	10	11
2	3.75	10	12
3	9.60	11	14
4	7.00	9	14
5	8.00	10	12
Averages:		10	$12^{3}/_{5}$

The relative toxic ratio of strychnine to brucine in the dog is, therefore, *one to forty-five.*

TABLE XV.—CATS—STRYCHNINE.

The dose of Strychnine Sulphate given to the cats subcutaneously, in the abdominal region, was 0.4 milligram per kilogram-body-weight.

Cat No.	Wt. in Kilograms.	Minutes to Hypersensitivity.	Minutes to Convulsions.
1	2.70	18	19
2	1.93	11	16
3	1.37	16	..
4	2.40	9	17
5	1.14	10	12
Averages:		$12^{4}/_{5}$	$15^{4}/_{5}$

TABLE XVI.—CATS—BRUCINE.

The dose of Brucine Sulphate given to the cats subcutaneously, in the abdominal region, was thirty-five times the dose of Strychnine Sulphate, or 14 milligrams per kilogram-body-weight.

Cat No.	Wt. in Kilograms.	Minutes to Hypersensitivity.	Minutes to Convulsions.
1	1.70	8	12
2	2.27	10	15
3	3.30	10	15
4	1.60	10	17
5	1.80	10	14
Averages:		$9^{3}/_{5}$	$14^{3}/_{5}$

The relative toxic ratio of strychnine to brucine in the cat is *one to thirty-five.* The strychnine cats showed a greater degree of individual susceptibility than any of the animals observed.

The relative degree of toxicity of strychnine to brucine was found to be relatively constant with the warm-blooded animals employed. The cold-blooded animal, the frog, showed a much greater ratio.

Convulsions appeared in all the animals under observation. The interval of time to death is not recorded in the tables, but the animals to which strychnine was administered showed about a fifty per cent recovery, whereas, in those to which brucine had been given, death ultimately occurred in almost one hundred per cent.

CONCLUSIONS.

1. Contrary to the reports of many investigators, there is fair uniformity in the percentages of total alkaloids in Nux Vomica, the lowest found being 2.000, and the highest 2.483. The average is 2.272, which is below the U. S. P. requirement of 2.5 per cent.

2. The generally accepted statement that strychnine and brucine occur in practically equal amounts is not correct. This study showed the following ratios for the eight samples examined:

Strychnine.	Brucine.	Strychnine.	Brucine.
41	59	46	54
43	57	47	53
43	57	49	51
45	55	54	46

Six of the eight samples, all showing a higher brucine content, gave an average strychnine-brucine ratio of 44 to 56. But one sample came close to a 50–50 ratio; and but one showed a higher strychnine content.

3. The rather general statement in the literature that galenical preparations of Nux Vomica contain more strychnine than brucine, is contrary to the findings of this investigation.

4. The relative amounts of strychnine and brucine present in preparations of Nux Vomica were found to be in fair accord with the relative amounts present in the crude drug.

5. Specie susceptibility is a decided influencing factor in any study of the relative potency of strychnine and brucine, and this fact probably accounts for the variations in mathematical comparisons which have been reported.

6. The cat and rabbit show a fairly close strychnine-brucine-toxicity-ratio, *viz.*, 1 to 37 for the rabbits, and 1 to 35 for the cat. The ratio for the dog was 1 to 45, and for the frog, 1 to 80. The dog and the rabbit are the more satisfactory animals for this type of comparative study.

7. The statement that strychnine is many times more potent than brucine, has been confirmed by this investigation.

8. The general statement that death is usually produced in brucine poisoning without even a trace of spasm, is not in agreement with the findings of this investigation. All brucinized animals showed convulsions which were of a much more severe type than those produced by strychnine.

NOTE: This investigation is the first reported systematized study of the strychine-brucine ratio in powdered Nux Vomica, its tincture and its fluidextract, and of the relative toxicities of strychnine and brucine.

9. A more accurate and satisfactory method for standardizing Nux Vomica and its preparations, from a pharmacodynamic and therapeutic angle, would consist in determining both the amount of total alkaloids and the amount of Strychnine. However, since a one-determination method appears to be more practicable, the strychnine content is a more satisfactory standard than the present total alkaloid content.

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New Pharmacy regulations in Turkey require that part of the pharmacy must be devoted to dispensing; a special laboratory must be installed for preparation of galenicals; proper provisions must be made for storing drugs and preparations. Certain serums must be stocked; also distilled and sterilized water. All pharmacies must be inspected at least twice a year.

ESTERS OF DIALKYLAMINO METHANOLS AS LOCAL ANESTHETICS.*

BY E. V. LYNN AND FREDERICK V. LOFGREN.

In a former paper (1) the preparation of a group of sixteen esters and soluble salts of eight of them, having a structure analogous to that of procaine, was described. Several of these esters were examined as to local anesthetic value. Two methods were used in this examination: (1) the time required to paralyze a motor-nerve-fibre and (2) the time required to anesthetize the cornea of a rabbit.

EXPERIMENTAL PART.

PARALYSIS OF MOTOR-NERVE-FIBRE.

The technique described by Sollmann (2) for determining the time required for paralysis of a motor-nerve-fibre was used.

Muscle-nerve preparations were obtained from frogs. They were made to include the lower end of leg from knee down and the entire sciatic nerve from the knee to the spinal cord with a bit of bone attached.

The muscle-nerve preparation was laid in 0.73 per cent NaCl in tap water until ready for use. In making the tests, the entire nerve was immersed in the anesthetic solution while the muscle was kept in the 0.73 per cent NaCl solution. The excitability of the nerve was tested with the platinum electrodes of an inductorium, activated by a current of about 3 volts. The stimulation was, of course, considerably above the threshold.

The stimulus was applied at the distal end of the nerve; that is, within one centimeter of the spinal origin. Generally, when the block was completed at this point, response could be obtained by moving the electrodes half down the nerve; but this was disregarded.

Experiments were made at room temperature (between 20° C. and 30° C.). The compounds soluble in water were dissolved in 0.73 per cent NaCl solution while those insoluble in water were dissolved in olive oil. The concentrations of the compounds were in geometric ratio ($^1/_2$, 1, 2, 4, 8 per cent).

All the hydrochlorides were dissolved in 0.73 per cent NaCl solution. Three of these salts showed some hydrolysis in solution, namely, di-*n*-butylaminomethyl-*p*-aminobenzoate HCl, diisoamylaminomethyl-*m*-aminobenzoate HCl and diisoamylaminomethyl-*p*-aminobenzoate HCl, but gave good physiological tests. All the cinnamates and benzoates had to be dissolved in olive oil, since they are not soluble in water and their soluble salts have not been prepared.

The following table gives the results obtained:

TABLE I.—TIME OF PARALYSIS OF SCIATIC NERVE IN MINUTES.

Compound. (Dissolved in 0.73% NaCl Solution.)	Percentage of Compound. 8.	4.	2.	1.	$^1/_2$.
Procaine HCl	...	5–10	10–20	40–50	50–60
Diethylaminomethyl-*m*-aminobenzoate HCl	...	20–30	30–40	78–80	90–100
Di-*n*-propylaminomethyl-*m*-aminobenzoate HCl	...	10–20	20–30	20–30	30–40

* Presented to the Scientific Section, A. PH. A., Miami meeting, 1931. Submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy at the University of Washington.

Compound. (Dissolved in 0.73% NaCl Solution.)	Percentage of Compound. 8.	4.	2.	1.	1/2.
Di-*n*-butylaminomethyl-*m*-aminobenzoate HCl	...	– 5	5–10	20–25	25–30
Di-iso-amylaminomethyl-*m*-aminobenzoate HCl	...	– 5	– 5	15–20	20–25
Diethylaminomethyl-*p*-aminobenzoate HCl	...	10–20	40–50	60–70	Uncertain
Di-*n*-propylaminomethyl-*p*-aminobenzoate HCl	...	5–10	10–20	20–30	30–40
Di-*n*-butylaminomethyl-*p*-aminobenzoate HCl	...	– 5	– 5	10–15	20–30
Di-iso-amylaminomethyl-*p*-aminobenzoate HCl	...	5– 7	10–15	20–25	30–35
NaCl 0.73 per cent solution 1	...	...	...	110–	...
(Dissolved in Olive Oil.)					
Diethylaminomethyl cinnamate	20–30	None	...	....	...
Di-*n*-propylaminomethyl cinnamate	None	...	...	....	...
Di-*n*-butylaminomethyl cinnamate	None	...	...	....	...
Di-iso-amylaminomethyl cinnamate	None	...	...	....	...
Diethylaminomethyl benzoate	– 5	10–15	20–25	35–40	...
Di-*n*-propylaminomethyl benzoate	20–25	25–30	None	....	...
Di-*n*-butylaminomethyl benzoate	None	...	...	....	...
Di-iso-amylaminomethyl benzoate	None	...	...	....	...
Olive Oil 1	...	...	50–60	....	...

The number to the left of the dash denotes the minutes when no paralysis noted, while the number to the right of the dash indicates the minutes required to paralyze the nerve.

ANESTHESIA OF RABBIT'S CORNEA.

Those of the compounds which formed water-soluble salts were examined as to anesthetic value by application to the cornea of a rabbit. The technique followed was that described by Sollmann (3). The salts were dissolved in 0.73 per cent NaCl solution. They were made in concentrations in geometric ratio (1/2, 1, 2, 4 per cent).

The lashes were clipped from the eyelids of the rabbits. The winking reflex was confirmed by touching the cornea with a pointed lead pencil. The lower eyelid was pinched into a pocket, into which was inserted an eyedropper filled with the anesthetic solution. The conjunctival sac was thus kept flooded for one minute, when the dropper was withdrawn and the rabbit released. In ten minutes the winking reflex was tested by touching the cornea, near the center, with the lead pencil. If this did not produce winking, the pencil was drawn across the cornea several times with moderate pressure. Great care must be taken to avoid touching the eyelid or the hairs about the eye.

If winking occurred with the first light touch, the result was considered negative as to anesthesia. If the winking occurred, but only sluggishly and after repeated and fairly severe pressure, it was interpreted as partial anesthesia. Absence of winking constituted the sign of complete anesthesia.

If after the end of the first period, the anesthesia was absent or only partial, the conjunctival sac was again filled with the solution, but the rabbit was not held for a minute, being released at once.

The tests and applications were repeated every ten minutes until five applications had been made, unless complete anesthesia had been attained before. No applications were made after anesthesia was complete. The tests, however, were continued for fifty minutes or longer to observe the time of partial anesthesia and complete recovering.

The following table gives the results obtained:

TABLE II.—ANESTHESIA OF RABBIT'S CORNEA.

Compound. (Dissolved in 0.73% NaCl Solution.)	Percentage of Compound. 4. A.	4. B.	2. A.	2. B.	1. A.	1. B.	1/2. A.	1/2. B.
Procaine HCl	4	30	None		....		....	
Diethylaminomethyl-*m*-aminobenzoate HCl	5*	?	5*	?	None		None	
Di-*n*-propylaminomethyl-*m*-aminobenzoate HCl	3	20	4	20	5	?	5*	?
Di-*n*-butylaminomethyl-*m*-aminobenzoate HCl	2	40	4	15	5*	?	None	
Di-iso-amylaminomethyl-*m*-aminobenzoate HCl	1	60	1	60	None		....	
Diethylaminomethyl-*p*-aminobenzoate HCl	5	10	None		None		None	
Di-*n*-propylaminomethyl-*p*-aminobenzoate HCl	1	60	None		None		....	
Di-*n*-butylaminomethyl-*p*-aminobenzoate HCl	2	20	2	10	None		....	
Di-iso-amylaminomethyl-*p*-aminobenzoate HCl	2	30	4	?	5	?	5*	?

"A" signifies number of applications (at 10-minute intervals) required to produce complete anesthesia.

"B" signifies number of minutes elapsing between the last application and complete recovery of sensation.

"*" signifies that the cornea was evidently less sensitive but still reacted.

"None" signifies no apparent anesthesia.

"?" signifies uncertain.

CONCLUSIONS.

The results of the experimentation indicate that all the soluble salts, and a few of the bases of which no salts were isolated, have local anesthetic action. Five salts, namely, di-*n*-propylaminomethyl-*p*-amino benzoate HCl, di-*n*-butylaminomethyl-*m*-aminobenzoate HCl, di-*n*-butylaminomethyl-*p*-aminobenzoate HCl, diisoamylaminomethyl-*m*-aminobenzoate HCl and diisoamylaminomethyl-*p*-aminobenzoate HCl were equal or better than procaine HCl when tested by paralysis of the sciatic nerve of a frog. Diisoamylaminomethyl-*m*-aminobenzoate HCl, di-*n*-butylaminomethyl-*p*-aminobenzoate HCl and diisoamylaminomethyl-*p*-aminobenzoate HCl were all about twice as effective as procaine HCl while diethylaminomethyl-*m*-aminobenzoate HCl, di-*n*-propylaminomethyl-*m*-aminobenzoate HCl and diethylamino-*p*-aminobenzoate HCl also caused paralysis but the effect was slightly weaker. In practically every case the anesthesia increased as the dialkyl group attached to the nitrogen became greater in molecular weight. Most of the *p*-aminobenzoate compounds were slightly more effective than the corresponding *m*-aminobenzoates. Diisoamylaminomethyl-*p*-aminobenzoate HCl decreased slightly in paralyzing effect over the corresponding di-*n*-butylamino compound, probably because its solution was hydrolyzed considerably. In general, the compounds of higher molecular weight were more subject to hydrolysis. This was especially true of the di-*n*-butyl and diisoamyl compounds.

Very few of the bases tested on the sciatic nerve of a frog gave results. Diethylaminomethyl cinnamate, diethylaminomethyl benzoate and di-*n*-propylaminomethyl benzoate caused paralysis but all were much weaker than procaine HCl. Diethylaminomethyl benzoate was about one-half as effective. Decreased solubilities of the bases probably accounted for the unsatisfactory results.

In general, the results obtained by paralyzing the sciatic nerve of a frog were duplicated when tested on the cornea of a rabbit. Di-*n*-propylaminomethyl-*m*-aminobenzoate HCl, di-*n*-butylamino-*m*-aminobenzoate HCl, and the corresponding *p*-aminobenzoate HCl's all appeared more effective than procaine HCl as a surface anesthetic. Only the diethylaminomethyl-*m*-aminobenzoate HCl and the

corresponding *p*-aminobenzoate HCl were less effective. In general, the anesthesia increased as the molecular weight of the dialkylamino group increased. Also the *p*-amino compounds were slightly more active than the *m*-amino compounds.

All of the compounds tested on the rabbit's cornea appeared to be more or less irritating as evidenced by the struggling of the rabbit when the first dose was applied and also, in some cases, by the inflammation of the lids. It appeared that the irritation increased considerably with the compounds which hydrolyzed the most, as the di-*n*-butyl and diisoamylamino-methyl-*p*-aminobenzoate HCl's. This irritation made it difficult in some cases to judge the time of recovery.

Summarizing the results of the pharmacological examination of the compounds, it was found that (1) dialkylaminomethanols esterified with *m*-aminobenzoic, *p*-aminobenzoic, benzoic and cinnamic acids have local anesthetic properties, (2) in general the anesthesia increased as the dialkyl groups attached to the nitrogen of the alcohol became greater in molecular weight, (3) the *p*-aminobenzoates were slightly more effective than the corresponding *m*-aminobenzoates, (4) benzoates and cinnamates could not be compared with the other compounds due to the inability of forming soluble salts, (5) five compounds were more effective or equal to procaine HCl when used to paralyze the sciatic nerve of a frog and the same five with one other appeared more effective or equal to procaine HCl when applied to the cornea of a rabbit, (6) the soluble salts hydrolyzed quite readily, which was especially true of the compounds of the higher molecular weight, (7) almost all of the compounds and especially those of the higher molecular weight were very irritating when applied to the cornea of a rabbit.

SUMMARY.

1. Sixteen compounds consisting of benzoyl, cinnamyl, *m*-aminobenzoyl and *p*-aminobenzoyl esters of a series of dialkylamino methanols, together with their salts, were compared with procaine HCl as to local anesthetic properties, (*a*) by paralysis of the sciatic nerve of a frog, and (*b*) by application to the cornea of a rabbit.

2. All the soluble salts prepared possessed considerably local anesthetic properties, several of them being more effective than procaine HCl. A few of the bases of which no salts were prepared showed some anesthetic properties.

3. The soluble salts, especially those of high molecular weight, were very irritating when applied to the cornea of a rabbit, which makes them objectionable for use as local anesthetics.

REFERENCES.

(1) Lynn and Lofgren, JOUR. A. PH. A., 21 (1932), 541.
(2) Sollmann, *Jour. Pharmacol.*, 10 (1917), 379.
(3) Sollmann, *Ibid.*, 11 (1918), 17.

The Chemist and Druggist states "**Pasta Zinci Oxidi Composita** introduces another variant of Lassar's Paste or what is known in the B. P. C. as **Pasta Zinci Composita**, as well as complicating things unnecessarily by what may become a persistent question as to what should be given for **Pasta Zinci Co.** The formula is included in most hospital pharmacopœias, the strength being usually the same as that of the B. P., but most of them contain in addition a small percentage of salicylic acid." The B. P. 1932 does not use the synonym—"Lassar's Paste."

SUGGESTED REASONS FOR COLOR CHANGES IN PRESCRIPTIONS CONTAINING SALICYLATES.

BY FREDERICK GRILL.*

INTRODUCTION.

An aqueous solution of sodium salicylate and sodium bicarbonate containing suspended magnesium hydroxide is given as an "incompatibility" in a course in prescription compounding, because this preparation is white in color when first prepared and gradually darkens in color to almost black after standing a few days in a cork-stoppered glass container. The solution of salicylate and bicarbonate containing the magnesium hydroxide suspended is not agitated while standing. The reasons for color change in the above preparation and in preparations similar to it are not explained satisfactorily in the literature consulted. The object of this paper is to offer some suggestions for these color changes under the conditions which have been described above.

Pharmaceutical literature gives little or no information concerning the color change which has just been described, and is equally non-informative concerning color changes similar to it.

Ruddiman[1] gives a prescription that contains salicyclic acid and sodium bicarbonate, each one ounce, and water a sufficient quantity to make six fluidounces as an "incompatibility." He remarks that carbon dioxide is evolved when the ingredients are mixed and the resulting solution is alkaline in reaction. On standing for two or three days this preparation changes color from light brown to dark brown. Ruddiman explains this color change as being due, probably, to the aqueous alkaline solution of a salicylate absorbing air, causing the oxidation of the salicylate. He does not indicate what compound or compounds are formed that give color to the solution and how the reaction (oxidation) proceeds.

Krantz[2] offers the suggestion that color changes which occur with salicylates in the presence of alkali bicarbonates are due to the absorption of atmospheric oxygen. He does not attempt to explain how the reaction between the salicylates and atmospheric oxygen proceeds in order to produce color.

The United States Dispensatory[3] reports the following colored compounds of iron and salicylic acid: "ferric disalicylate, black; ferric ferri-salicylate, blackish; basic ferric ferri-salicylate, rust-colored; and ferrous ferro-salicylate, yellow," but does not show which of these have been isolated in a pure state and found to be colored. Hence, it is not very definite and correspondingly unreliable, especially, as it does not seem to take into consideration the hydrolysis of salts of weak bases and weak acids.

To show more definitely under what conditions the color change noted in preceding paragraphs takes place and also to suggest further reasons for the development of color in the preparations given, the following experimental work was carried out.

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[1] Ruddiman, "Incompatibilities in Prescriptions," 4th Edition, pages 127 and 187 (1917).

[2] John C. Krantz, Jr., "Pharmaceutical Chemistry," page 105 (1928).

[3] "United States Dispensatory," 21st Edition, page 53 (1926).

EXPERIMENTAL PART.

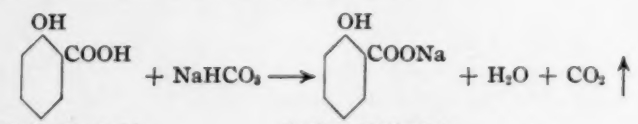
The following preparations were made and allowed to stand for a period of twenty days. The solutions were placed in ordinary glass bottles, stoppered with ungreased glass stoppers, and exposed to the varying daylight conditions of the laboratory. Each container had approximately twenty to twenty-five cc. volume of air above the surface of the solution. No attempt was made to obtain exact p_H values of each of the preparations. The reactions were obtained by litmus indicator. Quantitative measurements of light intensity and color analysis could not be determined because of lack of apparatus. Such color shades as were obtained were noted by visual inspection. The results are tabulated in Table I.

TABLE I.

No.	Solution.			Color Change. 24 hours.	48 hours.	72 hours.	20 days.
1	Sodium bicarbonate	5	Gm.				
	Magnesium hydroxide	5	Gm.	Colorless	Colorless	Colorless	Colorless
	Water	100	cc.				
2	Sodium bicarbonate	5	Gm.				
	Salicylic acid	5	Gm.	Light	Brown	Dark	Almost
	Water	100	cc.	brown		brown	black
3	Magnesium hydroxide	5	Gm.				
	Salicylic acid	5	Gm.	Colorless	Light	Light	Dark
	Water	100	cc.		brown	brown	brown
4	Sodium bicarbonate	5	Gm.				
	Sodium salicylate	5	Gm.	Colorless	Brown	Brown	Dark
	Magnesium hydroxide	5	Gm.				brown
	Water	100	cc.				
5	Sodium salicylate	5	Gm.				
	Sodium hydroxide	1.5	Gm.	Light	Brown	Brown	Dark
	Ferric chloride	0.5	Gm.	brown			brown
	Water	100	cc.				
6	Sodium salicylate	5	Gm.				
	Ferric chloride	0.5	Gm.	The color change from white to violet to purple			
	Water	100	cc.	took place almost immediately.			
	Hydrochloric acid, a quantity to make solution acid to litmus.						
7	Salicylic acid	5	Gm.				
	Sodium bicarbonate	5	Gm.				
	Ferric chloride solution			Colorless	Colorless	Light	Dark
	1 : 100,000	5	cc.			brown	brown
	Water	100	cc.				

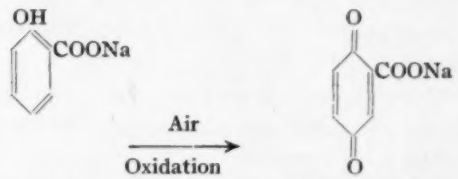
Preparation No. 1 would indicate that sodium bicarbonate, magnesium hydroxide and water, under the conditions described, will produce no color as compared with the other six preparations.

In preparation No. 2 there was an evolution of carbon dioxide. The container was not stoppered until the reaction had subsided.



Salicylic Acid. Sodium Salicylate.

The solution of sodium salicylate formed by the above reaction was alkaline to litmus. Due to the evolution of carbon dioxide and diffusion of air into the container the atmosphere above the solution was probably a mixture of carbon dioxide and air. The color change noted in Table I may be accounted for by the oxidation of the phenolic structure of sodium salicylate by atmospheric oxygen producing a rearrangement to the quinoid structure, in the presence of alkali.



Phenolic Structure of Sodium Salicylate. Colorless.

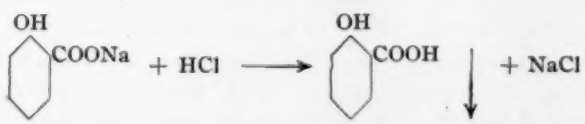
Quinoid Structure Acting as a Chromophore. Colored.

This reaction may be hastened by the action of light. Equal volumes of the colored salicylate solution and fifty per cent sodium hydroxide in water gradually produces a colorless solution. This suggests the reaction of phenolphthalein with concentrated sodium hydroxide in which the quinoid structure of the colored compound of phenolphthalein is changed to the benzoid structure. The reaction of the sodium hydroxide on the colored salicylate probably breaks the parallel arrangement of the quinoid structure forming a colorless compound. This strongly suggests the phenolic structure of the salicylate.

The color change in Nos. 3 and 4 may be explained in the same manner as the color change in No. 2.

Preparation No. 5 contained ferric chloride and the color change can be explained by the oxidation of the phenolic structure of sodium salicylate to a quinoid structure by ferric iron in the presence of light and atmospheric oxygen.

In preparation No. 6 salicylic acid was precipitated as a white crystalline precipitate in an excess of hydrogen ion as follows:

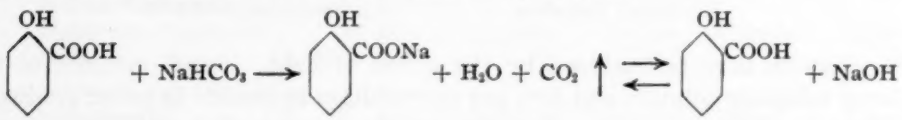


The color change observed here is probably again due to the oxidation of the phenolic structure of salicylic acid to a quinoid structure by ferric iron. The purple color of the solution was dispelled by concentrated sodium hydroxide solution indicating that the parallel arrangement of the quinoid structure (chromophore) of the salicylate is changed to the benzoid structure (colorless).

Preparation No. 7, alkaline to litmus, contained ferric iron. The color change here may be explained in the same way that the color change in No. 6 has been explained.

From Table I it is seen that the solutions containing the salicylate changed color. The solution (No. 1) of sodium bicarbonate containing suspended magnesium hydroxide did not change in color. It reasonably follows that the salicylate is the compound that is responsible, in part, for the color changes in the above preparations. In general, the color production in the six preparations can be explained by the oxidation of the phenolic structure of the salicylate to the quinoid structure by atmospheric oxygen, impurities of iron and light.

In order to show that iron is not alone responsible for any color change with a salicylate a qualitative solution of salicylic acid and sodium bicarbonate was made. This solution was alkaline to litmus because of hydrolysis.



Hydrogen sulphide was passed through the liquid under atmospheric pressure for fifteen minutes. The solution was filtered, the filtrate boiled to free of hydrogen sulphide as shown by lead acetate and transferred to a glass-stoppered bottle allowing only one to two cc. of air above the surface of the liquid. The solution was colorless when first prepared and turned in color to dark brown after standing for five days under varying daylight conditions. No precipitate was formed. This experiment indicates other agents besides iron effect color change with the salicylate, because ferric iron must be present in less quantities than the solubility product of ferrous sulphide, 3.7×10^{-19}.[1]

To show the effect of daylight and atmospheric oxygen on preparations containing salicylates in alkaline solution four solutions were made, each containing the following amounts:

Salicylic acid	10 Gm.
Sodium bicarbonate	10 Gm.
Water	200 cc.

The compounds were mixed separately with a portion of the water and placed into a bottle (similar to those used for solutions of magnesium citrate) and capped after the reaction between the salicylic acid and sodium bicarbonate had subsided to some extent. This would allow most of the air to be displaced by the carbon dioxide in the bottle above the surface of the liquid. The solutions were alkaline to litmus for reasons previously given. This did not insure a complete elimination of air because there was no attempt to free the solution of dissolved air and there remained a small amount of air in the neck of the bottle that had not been displaced by the evolved carbon dioxide. From the results that are shown later this amount of air did not materially interfere with the purpose of the experiment. Two of the solutions made in this manner were protected from daylight by wrapping in three thicknesses of photographic black paper and one thickness of ordinary wrapping paper and stored in very diffuse daylight. The other two solutions were subjected

[1] Handbook of Chemistry and Physics: 16th Edition, page 581 (1931).

to varying daylight conditions. The four preparations were kept in this manner for ninety days. At the end of this time the solutions that had been protected from daylight were unwrapped and color changes compared with freshly prepared solutions made in the manner described above. The four bottles were unstoppered and exposed to daylight and air for a period of another thirty days. The results are summarized in Table II.

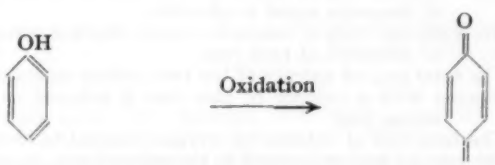
TABLE II.

No.	Ferric Iron Added.	Whether or Not Exposed to Light.	Color Change after 90 Days.	Color Change after 120 Days. Exposed to Light and Air for 30 Days.
1	0.5 cc. *Nl* $FeCl_3$	+	Colorless to brown	Dark brown
2	No iron	+	Colorless to dark brown	Black
3	0.5 cc. *Nl* $FeCl_3$	−	Colorless to very light brown	Dark brown
4	No iron	−	No color change	Black

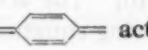
Preparations Nos. 1 and 2 as compared to preparations Nos. 3 and 4 would indicate light affects positively the speed of the reaction producing color. Comparing preparations Nos. 3 and 4 the results would indicate ferric iron in the absence of light and a minimum concentration of air affects positively the speed of reaction producing color. The presence of air is shown in the last column of Table II. When the bottles containing the salicylate solutions were opened to the air, preparations Nos. 1 and 2 deepened in color more rapidly than when not exposed to air. Preparations Nos. 3 and 4 show the effect of light and air. In both the latter solutions the color changed more rapidly after exposure to light and air. The constriction of the neck of the bottle would allow for a minimum concentration of air over the surface of the liquid and it might have been better to transfer the solutions to beakers.

CONCLUSIONS.

(1) The color change in each of the preparations of Tables I and II can be explained by the oxidation of the phenolic structure of the salicylate to a quinoid structure.



The rate of oxidation is affected positively by (*1*) light, (*2*) air and (*3*) ferric iron when the salicylate is in alkaline solution.

(2) Porter[1] states that the quinoid structure of the ring  acts as a chromophore.

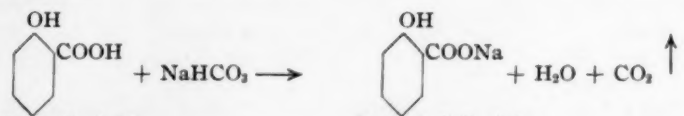
(3) Krantz[2] explains the color change of phenol to pink and red somewhat as follows: Phenol is oxidized by air (this oxidation being influenced by heat and light) to quinol, quinone and catechol and the color is probably given by condensa-

[1] C. W. Porter, "The Carbon Compounds," 2nd revised Edition, page 288 (1931).
[2] John C. Krantz, Jr., "Pharmaceutical Chemistry," page 118 (1928).

tion products of quinone. Krantz has apparently overlooked the fact that ferric iron[1] also produces a color with phenol, this being a general reaction for the aromatic compounds that have the hydroxyl group in the ring. Salicylic acid and its salts contain the hydroxyl group in the ring and it is thus related definitely to the phenols. The oxidation of the phenolic structure of salicylates to a quinoid structure by atmospheric oxygen will explain more fully the color change noted by Ruddiman and Krantz—see page 765.

(4) The experiments show that visible light affects positively the production of color in alkaline solutions of salicylates under the conditions described. It is not the purpose of this paper to account for the structural change in the salicylate molecule as produced by light energy.

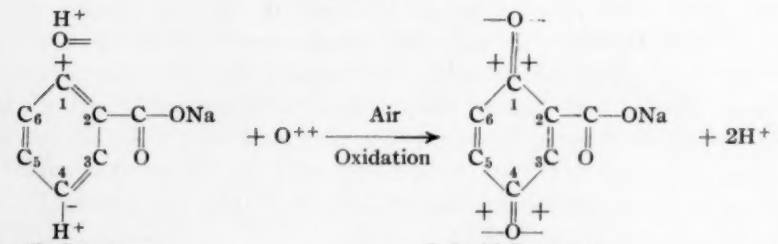
(5) The action of air on salicylates producing color may be shown by the following equations.

(1) 

Salicylic Acid. Sodium Salicylate.

(2) $O_2 \rightleftharpoons O^{++} + O^{--}$

Atmospheric Oxygen.

(3) 

Phenolic Structure of Salicylate. Colorless.

Quinoid Structure Chromophore. Colored.

(4) $2H^+ + O^{--} \longrightarrow H_2O$

Equation No. 3 (*a*) No. 1 carbon, sum of valencies plus one, is oxidized to carbon with a sum of valencies equal to plus two.
(*b*) No. 4 carbon, sum of valencies minus one, is oxidized to carbon with a sum of valencies of plus two.
(*c*) The total gain of valence of the two carbon atoms is equal to four.
(*d*) Oxygen with a valence of plus two is reduced to oxygen with a valence minus two.
(*e*) The total loss of valence for oxygen is equal to four.
(*f*) The valence gained is equal to the valence lost, as must be the case in every chemical change.

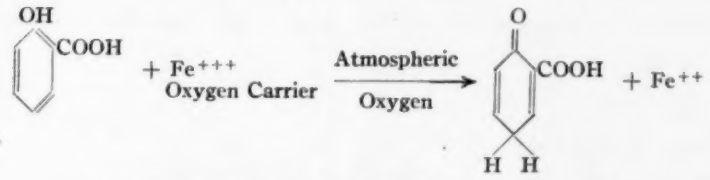
(6) The action of iron on salicylates producing color may be shown by the following equations.

(5) $Fe^{++} \underset{\longleftarrow}{\overset{\text{Air}}{\rightleftharpoons}} Fe^{+++}$

The oxidation of ferrous iron to ferric proceeds more readily in alkaline solution than in acid solution.[2]

[1] E. Emmet Reid, "College Organic Chemistry," page 508 (1929).

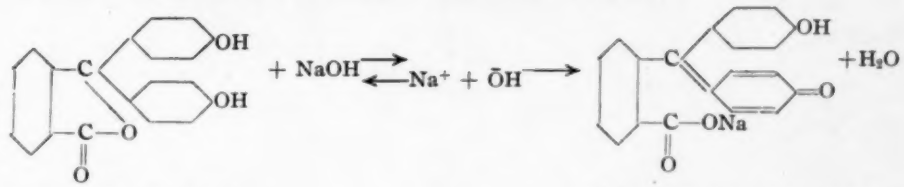
[2] Latimer and Hildebrand, "Reference Book of Inorganic Chemistry," page 308 (1929).

(6) 

Phenolic Structure of Salicylate. Colorless.

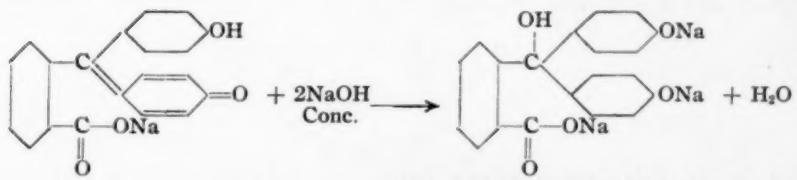
Quinoid Structure Acting as a Chromophore. Colored.

(7) Preparation No. 2 (Table I) was decolorized when a fifty per cent solution of sodium hydroxide was added as described. As suggested before, the reaction between phenolphthalein and strong sodium hydroxide is very similar and the two reactions may be described by the following equations.

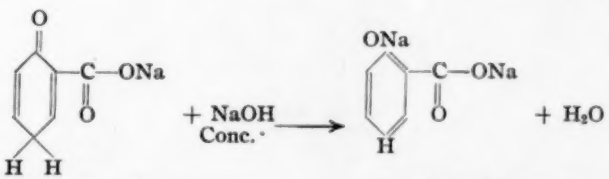
(7) 

Lactone, Colorless, Acid.

Quinone, Red, Weakly Alkaline

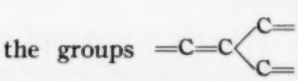
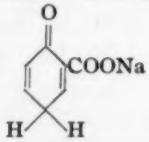
(8) 

Sodium Salt of Carboxylic Acid, Colorless, Strongly Alkaline.[1,2]

(9) 

Sodium Salicylate, Quinoid, Colored.

di-Sodium Salicylate, Benzoid, Colorless.

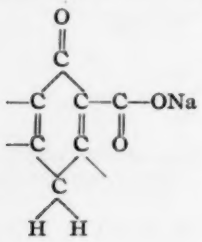
(8) Porter[3] states that the groups  and —CO—CO— act as chromophores. This suggests further reasons for the quinoid structure of sodium salicylate  being colored. The carbonyl group in the side chain is di-

[1] Richter's "Organic Chemistry," Trans. D'Albe, E. E. Fournier, 11th German Edition, Vol. 2, page 597 (1922).

[2] I. M. Kolthoff and N. H. Furman, "Indicators," Trans., 2nd German Edition, page 238 (1926).

[3] C. W. Porter, "The Carbon Compounds," 2nd revised Edition, page 288 (1931).

rectly attached to a carbon in the ring having a double bond and the arrangement

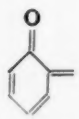


parallels the structure

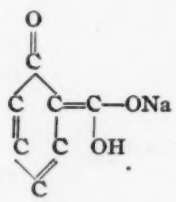
This is not strictly the chromophore group as given by Porter but may exert an influence in the formation of color with the quinoid structure of the salicylate. Also the possibility of a keto-enol equilibrium existing may add to the production of color because:

(*10*)

(*a*) existence of a quinoid structure.



(*b*) two adjacent carbon atoms in the ring having double bonds paralleling



the structure —CO—CO— given by Porter as a chromophore.

(9) From the experimental work and the theoretical considerations suggested the "incompatibility" magnesium hydroxide, sodium bicarbonate, sodium salicylate and water is due to an oxidation of the salicylate. The oxidation will take place in the presence of atmospheric oxygen and impurities of ferric iron to form the quinoid structure of the phenolic group in the salicylate as illustrated in Equations 1 to 10. The experiments would indicate that visible light affects the formation of color.

(10) An "incompatibility" of this type is rather difficult for the dispenser to correct. However, the production of color in similar preparations might be reduced somewhat by observing: (1) The use of chemically pure materials, more especially iron free; (2) the use of tightly stoppered containers to prevent excessive diffusion of air; (3) the use of freshly boiled water; and (4) the use of colored glass containers.

SUMMARY.

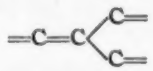
(*1*) Colorless solutions of salicylates in the presence of an alkali change in color to dark brown to almost black.

(*2*) The reasons suggested for this color change are:

(*a*) Salicylates have a phenolic structure;
(*b*) Because of this they are oxidized by:
(1) atmospheric oxygen
(2) light
(3) presence of ferric iron.

(*3*) The oxidation products are probably compounds having quinoid structure.

(*4*) A keto-enol equilibrium may affect the production of color, because of the existence of the structures paralleling the chromophore structures

 and —CO—CO—

(*5*) The "incompatibility" magnesium hydroxide, sodium bicarbonate, sodium salicylate and water which changes in color to a dark brown to almost black can be explained by the reactions as indicated in Paragraphs 2 to 4.

(*6*) The color change may be controlled to some extent by using:

(*a*) chemically pure materials, more especially those which are iron free
(*b*) recently boiled water
(*c*) colored glass containers.

EARLY METHODS OF DISEASE PREVENTION.

The British Pharmaceutical Conference will meet in Aberdeen in September and this prompts the following quotation by our esteemed contemporary, *The Chemist & Druggist*, in reviewing Dr. John D. Comrie's "History of Scottish Medicine," now in its second edition, wherein it states—"It is recorded in 1578 that rats could not live in Aberdeen; and to this fact (if it is a fact) is attributed the comparative immunity of the northern city from plague. Whether or not this is so, the authorities of the city were the first to order (in 1647) that poison should be laid down for rats and mice, from which it may be inferred that vermin could find subsistence there in the seventeenth century if not in the sixteenth. With equal fullness the author has treated Edinburg, Glasgow and St. Andrews, the other three cities which were the sites of universities at a time when England had only two. The scale on which this sumptuously printed work is planned has involved the recording of the rise and progress of medicine in the Scottish universities in considerable detail. The contribution to medicine of such typical figures as James Gregory, James Young Simpson, Robert Christison and Joseph Lister is described in a style both readable and authoritative. In addition, the footnotes and the index have the value that is expected in a history written on this scale. The plan of the work has involved slight overlapping; but this is a minor matter, and Dr. Comrie is to be congratulated on bringing a laborious task to a successful issue."

Al Mansur Gilafun said of the hospital which he founded at Cairo in 1283: "I have founded this institution for my equals and for those beneath me. It is intended for rulers and subjects, for soldiers and for the emir, for great and small, freeman and slaves, men and women."

TINCTURES OF KINO, KRAMERIA AND GAMBIR COMPOUND. A STUDY IN STABILITY AND ASSAY METHODS.—A PRELIMINARY REPORT.

BY AARON LICHTIN.*

INTRODUCTORY.

It is generally conceded that the potency of Kino, Krameria, Gambir and their preparations depends on the tannin content. These tannins are subject to changes which materially reduce their usefulness. Accordingly, assay processes for these drugs and their preparations comprise methods which determine tannin content.

The number of methods of tannin assay is large. Allen states that 94 methods have been elaborated.[1] The choice of a particular assay process depends on the use to which a tannin material is put. A tanner evaluates tannin materials by their ability to combine with hide to form leather. For his purpose the hide powder method is very useful. For the dyer who is interested in the dyeing properties of tannins the hide powder results are of little value and a different method of evaluation is required. The physician on the other hand is interested in the astringent effect of tannins on body tissues. A method of assay is required, therefore, which will determine the amount of therapeutically active substance in the tannin material.

It is the purpose of this investigation to select a method or methods of assay which are applicable to the determinations of tannins in tannin-bearing drugs and their preparations which are used for their astringent effect; incidentally, the stability of the preparations is to be determined.

The experiments reported in this study were done on Kino, Krameria, Gambir and preparations (tinctures) of these drugs.

EXPERIMENTAL.

(A) The following tinctures were prepared:

Tincture of Kino U. S. P. X
Tincture of Krameria U. S. P. X
Compound Tincture of Gambir U. S. P. X

Methods and menstrua employed; all by percolation:

Group I—U. S. P. methods and menstrua
Group II—4 volumes of alcohol, 1 volume of water
Group III—4 volumes of alcohol, 1 volume of glycerin.

(B) Assay Methods:

The following methods were tried; Scoville suggested the use of I, a colorimetric method with an iron reagent to indicate total tannoid bodies and II, a precipitation method to indicate unhydrolized tannins. Thus gallic acid, for example, would be included in an assay by Method I but not by Method II. The stability of a tincture as well as tannin-content may be thus demonstrated.

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[1] Allen's "Organic Analysis," 5th Edition, Vol. V, page 107.

I. The Colorimetric Method.[1]

Technique and Reagents required:

1. Iron mixture—0.04 Gm. potassium ferricyanide in 500 cc. H_2O; add 1.5-cc. solution ferric chloride.
2. Tannin solution—0.04 Gm. purest obtainable tannin in 500 cc. H_2O.
3. Solution to be tested—0.8 Gm. of drug to 500 cc. H_2O.

Place six 50-cc. beakers on a white surface.

In No. 1 place 5 drops of drug extract.
In No. 2 place 4 drops tannin solution.
In No. 3 place 5 drops tannin solution.
In No. 4 place 6 drops tannin solution.
In No. 5 place 7 drops tannin solution.
In No. 6 place 8 drops tannin solution.

Place 5-cc. iron mixture in each beaker; after one minute add 20 cc. of water; examine within three minutes.

The test was tried as described with no satisfactory results. The tannin standard solution (being gallotannin) gives a blue color with iron salts while the tannins under test (being of the catechol group) yield green solutions with iron salts. Therefore, this is not a satisfactory method of color comparison. To overcome this, cinchotannic acid, which is a catechol tannin (prepared in the writer's laboratory) was tried as a standard for color comparison. Here, again, the tints could not be compared as the drug solutions were turbid and the colors formed by the addition of iron reagent were not clear. Accordingly, comparison was either difficult or impossible.

Another attempt was made employing the following technique.

Infusion of drug, 50 mg. to 250 cc., was prepared. This was shaken with two portions, each 25 cc. ethyl acetate. The ethyl acetate solutions were again shaken with two portions, each 25 cc. distilled water. These aqueous solutions were compared colorimetrically with solutions of cinchotannic acid by the addition of iron reagent. All solutions in this trial were clear but the drug solutions were not of the same shade of green as the standard. They were bluish green and, therefore, not comparable.

This matter was taken up with the laboratory of Hide and Leather Investigation, Department of Agriculture, Washington who wrote as follows:

> "The development of a bluish green color to which you refer is the result, probably, of the presence, in small amounts, of the natural tannins and closely related non-tannins of the pyragallol or iron-bluing group, as distinct from the catechol tannins or those that produce green with iron salts. It is because of the occurrence of such admixture in natural products that we have given little consideration to colorimetric methods, and I believe that you have but little chance of developing a satisfactory method along such lines."

II. Precipitation Tests.

a. By Use of Gelatin and an Indicator.[2]

This test depends on the precipitation of tannin by gelatin in the presence of an aniline dye. The end-point is indicated by the decolorization of the solution.

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[1] Allen's "Organic Analysis," 5th Edition, Vol. V, page 186.

[2] "Allen," 5th Edition, Vol. V, page 175.

Technique and solutions required:

1. A small quantity (few cc.) of 10 per cent solution of mercuric iodide in its own weight of potassium iodide.
2. *Tannin Solution.*—Five grams pure gallotannin in distilled water, add 0.5-cc. solution No. 1 and sufficient distilled water to make 1000 cc.
3. *Gelatin Solution.*—Five grams gelatin in about 1000 cc. hot distilled water. Boil the liquid, add sufficient white of egg to clarify it, cool, add 0.5-cc. solution No. 1 and NaOH solution to render slightly alkaline and distilled water sufficient to make 1000 cc.
4. *Calcium Acetate Solution.*—Fifty grams of pure dry calcium acetate in 1000 cc. H_2O. filter and add few drops solution No. 1.
5. Indicators—4 per cent Nicholson's blue BB, or 1 per cent Blue-Black NBI, or 1 per cent solution methylene blue for tannin solutions which are not colored.

Use 60-cc. flask with 3-cm. neck. Place 1-cc. gelatin solution, 2 drops indicator 5-cc. calcium acetate solution; fill with distilled water to neck at 75° to 80° C. by means, of small burette at 40 drops to a cc. Add small quantity of standard tannin solution a little at a time and shake after each addition until decolorized. Repeat the same with the unknown. Allow precipitate to rise in the neck of the bottle. The process is repeated with a solution of the unknown, which if acid should be cautiously neutralized.

The writer was unable to obtain either Nicholson's blue BB or Blue-Black NBI. Methylene blue was used as the indicator but the results were not satisfactory as it was difficult to ascertain the end-point. The precipitate settled instead of rising.

b. Precipitation with Quinine Sulphate.[1]

Technique and reagents used:

1. *Standard Tannin Solution* to represent 250 mg. tannin in 10-cc. solution, prepared as under II-*a*, solution No. 2.
2. *Unknown.*—Prepare solution to represent about 150 mg. tannin in 400 cc. of water and filter.
3. *Quinine Reagent.*—For each test use a solution of

Quinine Sulphate	1.0 Gm.
H_2SO_4, $N/_1$	2.5 cc.
Water to make	25.0 cc.

Dilute sample to 400 cc., add 25-cc. solution No. 3, allow to stand about 15 minutes, filter on a tared filter paper, dry, precipitate and weigh.

The standard tannin solution was used to check the accuracy of the method. Weight of precipitate times 0.75 equals weight of tannin.

This method was used for the nine tinctures, with results indicated in Table I.

III. The Lowenthal Permanganate Method.

Due to the high standing of this method and also due to the suggestions of the Drug Research Unit (L. E. Warren) and the Hide and Leather Investigation Laboratory (Mr. Frey) both of the Department of Agriculture, the writer attempted to adopt this method for use in assaying the nine tinctures.

Technique and solutions:

1. *Potassium Permanganate Solution* 1 : 1000.
2. *Indigo Carmine Solution.*

[1] "Allen," 5th Edition, Vol. V, page 180.

Indigo Carmine	5 Gm.
Concent. H_2SO_4	50 cc.
Dist. Water to make	1000 cc.

This solution must be titrated with the $KMnO_4$ solution so that 20-cc. indigo carmine solution is decolorized by about 14–16 cc. $^1/_{1000}$ $KMnO_4$ solution.

3. *Gelatin Solution.*—2 per cent gelatin solution prepared in the usual way and preserved with mercuric iodide-potassium iodide solution as under Method 2-*a*, solution No. 3.
4. *Salt Solution.*

Concent. H_2SO_4	50 cc.
Dist. H_2O to make	1000 cc.
NaCl to saturation.	

Use enough of the unknown drug so that it requires not over 10 cc. $^1/_{1000}$ $KMnO_4$ to oxidize it. Dilute with distilled water to about 750 cc. and add 20-cc. indigo carmine solution. To this mixture add enough $^1/_{1000}$ $KMnO_4$ solution from a burette, one cc. at a time to decolorize the 20 cc. of indicator, shaking the flask briskly after each addition. Continue adding $KMnO_4$ solution until contents of flask are decolorized, that is, turn yellow. Now subtract total number of cc. $KMnO_4$ from that required to decolorize 20 cc. of indicator and call it *a*.

Gelatin precipitation:

Use an amount of unknown equal to five times the quantity used in the first titration but not exceeding 50-cc. in volume. Add 25-cc. gelatin solution and 25-cc. salt solution and 10 Gm. Kaolin. Shake briskly several minutes and filter. Use 20 cc. of filtrate (equal to amount of drug in first titration), dilute to about 750 cc., add 20-cc. indigo carmine solution and titrate with $KMnO_4$ solution as above.

Let number of cc. $KMnO_4$ used in this titration = C. Therefore $a - C$ = cc. $^1/_{1000}$ $KMnO_4$ used in oxidation of tannins. C = number of mg. $KMnO_4$ required to titrate 63 mg. oxalic acid (10 cc. $N/10$ oxalic acid). C = 31. Therefore $C:(a - b) = 63+$.

Using this method and formula the tannin content of the drugs and tinctures was calculated and the results indicated in Table II.

The quantity of drug or tincture required in the titrations so as not to require more than 10 cc. $KMnO_4$ solution for oxidation was determined by repeated trial.

TABLE I.—INDICATING RESULTS OF PRECIPITATION BY QUININE SULPHATE.

Sample.	Name of Preparation.	Quantity Used for Test.	Quantity of Drug Represented Mgms.	Wt. of Ppt.	Wt. Tannin.	Per Cent Tannin.
1	Standard Tannin Solution	10 cc.	250	320 mg.	240.00 mg.	96.0%
2	Tr. Kino, U. S. P.	5 cc.	500	165 mg.	123.75 mg.	24.6%
3	Tr. Kino, 4 vol. Alc., 1 vol. H_2O	5 cc.	500	165 mg.	123.75 mg.	24.6%
4	Tr. Kino, 4 vol. Alc., 1 vol. Glyc.	5 cc.	500	165 mg.	123.75 mg.	24.6%
5	Tr. Krameria, U. S. P.	5 cc.	1000	180 mg.	120.00 mg.	12.0%
6	Tr. Krameria, 4 vol. Alc., 1 vol. H_2O	5 cc.	1000	180 mg.	120.00 mg.	12.0%
7	Tr. Krameria, 4 vol. Alc., 1 vol. Glyc.	5 cc.	1000	180 mg.	120.00 mg.	12.0%
8	Tr. Gambir Comp., U. S. P.	10 cc.	500	80 mg.	60.00 mg.	12.0%
9	Tr. Gambir Comp., 4 vol. Alc., 1 vol. H_2O	10 cc.	500	80 mg.	60.00 mg.	12.0%
10	Tr. Gambir Comp., 4 vol. Alc., 1 vol. Glyc.	10 cc.	500	80 mg.	60.00 mg.	12.0%

TABLE II.—INDICATING RESULTS OF LOWENTHAL'S METHOD.[1]

Sample.	Name of Preparation.	Quantity of Drug Represented.	Value of *a*.	Value of *b*.	Per Cent Tannin in Terms of Oxalic Acid.
1	Standard Tannin Solution	15 mg.	10.0 cc.	1.5 cc.	114.90
2	Tr. Kino, U. S. P.	20 mg.	7.0 cc.	3.0 cc.	40.65
3	Tr. Kino, 4 vol. Alc., 1 vol. H_2O	20 mg.	7.0 cc.	3.0 cc.	40.65

Sample.	Name of Preparation.	Quantity of Drug Represented.	Value of *a*.	Value of *b*.	Per Cent Tannin in Terms of Oxalic Acid.
4	Tr. Kino, 4 vol. Alc., 1 vol. Glyc.	20 mg.	6.0 cc.	3.0 cc.	30.40
5	Tr. Krameria, U. S. P.	80 mg.	10.0 cc.	4.5 cc.	13.90
6	Tr. Krameria, 4 vol. Alc., 1 vol. H_2O	80 mg.	10.0 cc.	4.5 cc.	13.90
7	Tr. Krameria, 4 vol. Alc., 1 vol. Glyc.	80 mg.	10.0 cc.	5.0 cc.	12.70
8	Tr. Gambir Co., U. S. P.	20 mg.	8.0 cc.	6.0 cc.	20.30
9	Tr. Gambir Co., 4 vol. Alc., 1 vol. H_2O	20 mg.	8.0 cc.	6.0 cc.	20.30
10	Tr. Gambir Co., 4 vol. Alc., 1 vol. Glyc.	20 mg.	8.0 cc.	6.0 cc.	20.30
11	Infusion Kino,[2] U. S. P., 1%	20 mg.	7.0 cc.	3.0 cc.	40.65
12	Infusion Krameria, U. S. P., 4%	80 mg.	8.0 cc.	2.0 cc.	15.25
13	Infusion Gambir, U. S. P., 0.5%	20 mg.	8.5 cc.	6.0 cc.	25.40

[1] Allen gives the following figures in terms of oxalic acid:

Pure Tannin	Botanical names not indicated	120–22
Kino		51–59
Krameria		19–20
Gambir		43–51

[2] The infusions were prepared by boiling the required quantity of the drug ½ hour in half the volume of water of the expected finished infusion, straining and adding sufficient water to the desired volume.

COMMENTS.

1. *Appearance of Tinctures.*—The tinctures were prepared early in September 1931. Judging from their appearance at the writing of this report it would seem that the best method for the preparation of Tincture of Kino is the present U. S. P. method; Tincture of Krameria is by employing a menstruum of 4 volumes of alcohol, 1 volume of glycerin; Tincture of Gambir Compound by using a menstruum of 4 volumes alcohol and 1 volume of glycerin.

2. In inspecting the figures quoted from Allen's in Table II it must be borne in mind that botanical names are not given. This is significant, for it will be found, for instance, that Kino has a tannin content of 30.3 per cent to 73.2 per cent depending on the botanical variety (see page 51, "Allen," Vol. 5, 5th Edition).

3. The Assay methods reported in this preliminary report reveal the quantity of material precipitated by quinine sulphate and gelatin. The amount of hydrolized material such as catechins or gallic acid present in the preparation is not indicated. Experimental work is being done with a view to elaborate the assay methods, so as to include in the process the determination of both hydrolyzed and unhydrolyzed material. Stronger alcoholic menstrua will be tried to observe their effects on the stability of the preparations.

ACKNOWLEDGMENT.

The writer is indebted to L. E. Warren of the Drug Research Unit and R. W. Frey of the Hide and Leather Investigation Laboratory, both of the Department of Agriculture, for valuable suggestions during the preparation of this paper.

Volumetric Determination of Quinine.—D. Jatrides and G. Thomis, after a study of a number of methods for determination of quinine in pharmaceuticals, recommend the following: The alkaloid is extracted from an alkaline solution with chloroform; an aliquot portion is diluted with 95% alcohol and titrated with 0.2 normal hydrochloric acid, using lacmoid as indicator; the end-point is determined by colorimetric comparison with standard adjusted to p_H of 4.9 to 5.0.—*J. pharm. chim.*, 15 (1932), 230–242.

THE BEHAVIOR OF IODINE SOLUTIONS AT LIQUID-SOLID INTERFACES.

I. THE WETTING POWER OF IODINE FROM VARIOUS ANTISEPTIC SOLUTIONS.

BY GEORGE M. KARNS.[1]

Antiseptics as a class are regarded as contact medicinals, and hence their behavior at surfaces is a factor that has an important influence on their effectiveness. With the exception of surface tension studies of antiseptics, which have been the subject of extensive discussion, little attention has been given to other physical properties of poly-component-uniphase systems under the conditions of use. As solvents are important in their influence on the surface behavior of solutions, we may well consider their influence upon the behavior of active medicinal ingredients dissolved in them.

Because the field of activity of a contact medicinal is usually at or begins at the medicinal-organism interface, we have chosen to consider its adsorption behavior at surfaces as a fundamental property. Adsorption concentration at equilibrium rather than the actual concentration in solution would be the governing factor determining the dose of active agent upon bacteria or tissue. Adsorption behavior should also affect penetration of the effective agent, because penetration rate is governed by the concentration gradient between the treated surface and the penetrated interior as well as the actual amount of solution passing through the membrane.

In order to obtain some idea of the surface conduct of iodine antiseptic solutions, this investigation has been made of the adsorption of iodine upon silk fibre from a series of iodine solutions, including those in aqueous potassium iodide, potassium iodide-alcohol-water and potassium iodide-water-glycerine.

EXPERIMENTAL PART.

Commercially scoured silk yarn was selected as a receiving medium, because it is a material that approaches skin in chemical nature and has a comparatively large surface per unit of weight. All the samples for the entire investigation were taken from a single cone of yarn. Weighed samples (approximately 0.4 Gm. when dry) were placed in 250 cc. of the solution under investigation, which was kept at 25° C. up to the time of immersion. These samples were allowed to remain until equilibrium was established between the free iodine deposited upon them and that in the solution. The samples were then removed and centrifuged for four minutes at 2200 r. p. m., shaken out to disturb capillary spaces, centrifuged again for a like period, and placed in an excess of standard thiosulphate solution until the free iodine had reacted; the residual thiosulfate was then titrated with acidified potassium iodate. The free iodine concentration in the solution at equilibrium was determined by analysis. The time of immersion of the samples was five minutes, which was taken as a standard time after it had been found adequate for the establishment of a practical equilibrium.

[1] Industrial Fellow, Mellon Institute of Industrial Research, Pittsburgh, Pa.

Contribution from the Iodine Educational Bureau's Industrial Fellowship, Mellon Institute of Industrial Research, Pittsburgh, Pa.

Since the variation in the amount of free iodine adsorbed from different solutions disturbed their free iodine concentration, the data were adjusted to a common free-iodine standard before the curves were plotted. Following the procedure described above, adsorption values could be reproduced with less than 2 per cent variation, except in solutions high in free iodine.

DISCUSSION OF RESULTS.

The data from the investigation of these solutions are presented in the curves in Figs. 1, 2 and 3. Figure 1 shows the amount of iodine in mg. adsorbed per Gm. of silk, plotted against the potassium iodide present in the solution in excess of that contained in a saturated iodine solution of the prescribed concentration in aqueous potassium iodide. The horizontal scale indicating the amount of potassium iodide present in the solution in excess of that necessary for dissolving

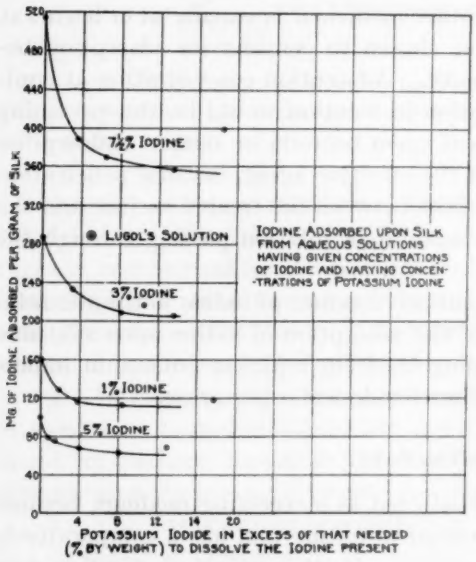
Mg. of Iodine Adsorbed per Gram of Silk
7½% Iodine
Lugol's Solution
3% Iodine
1% Iodine
.5% Iodine
Iodine Adsorbed upon Silk from Aqueous Solutions having given concentrations of Iodine and varying concentrations of Potassium Iodine
Potassium Iodide in Excess of that needed (% by weight) to dissolve the Iodine present

Fig. 1.

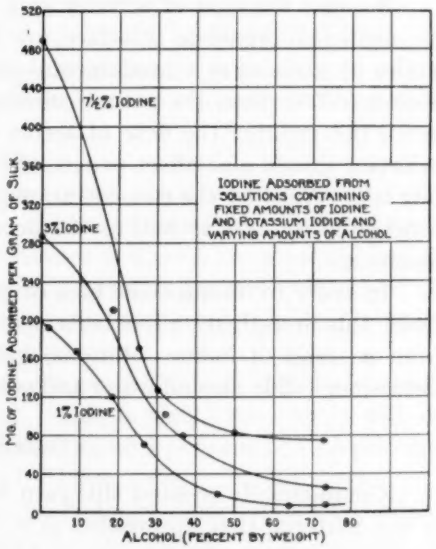
Mg. of Iodine Adsorbed per Gram of Silk
7½% Iodine
3% Iodine
1% Iodine
Iodine Adsorbed from Solutions containing fixed amounts of Iodine and Potassium Iodide and varying amounts of Alcohol
Alcohol (percent by weight)

Fig. 2.

the iodine may be considered as an approximate comparative measure of its unused iodine solvent power. The curves for alcohol and glycerin are shown in Figs. 2 and 3, the horizontal axis representing the composition of the alcohol-water or glycerin-water constituent in which the iodine and potassium iodide are dissolved, the zero position representing, as in the aqueous potassium iodide curves, a saturated iodine solution of the indicated strength in potassium iodide. A similarity in the curves is evident in that there is a qualitative inverse proportionality between the unused solvent power, as indicated by increasing organic constituent, and the amount of iodine adsorbed per unit weight of silk. It has been found upon examination of the curves for potassium iodide solutions that the relationship referred to is approximately logarithmic. The decrease in the amount of iodine adsorbed from solutions of increasing alcohol and glycerin strength, however, is much more sharp and complete than would be indicated by this relationship to solubility to which the aqueous iodide solutions approximately conform. The extent of this

difference is evident from Fig. 4, in which the iodine adsorbed from 1 per cent solutions is plotted against the unused solvent power for iodine of the three types of solution investigated.

The practical consideration of greatest interest shown in these data is that surfaces are much more readily wet with iodine from aqueous iodide solutions than they are from alcohol or glycerin solutions of like iodine strength.

Though we are interested primarily in the adsorption values of our active agent from solutions in various solvents, as described above, it may be well, in the interest of further generalizations that may be made from the data, to consider the properties of the solution that govern the adsorption of a single constituent, which we may roughly term partial wetting power. Such a consideration is further advisable to determine whether some other and simpler approach may be made to the ques-

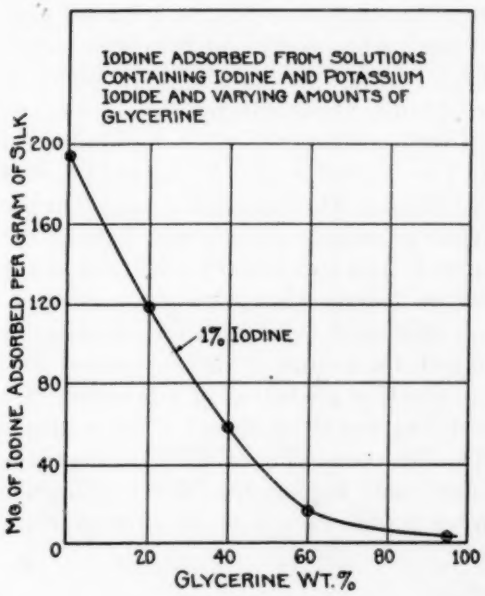

Fig. 3.

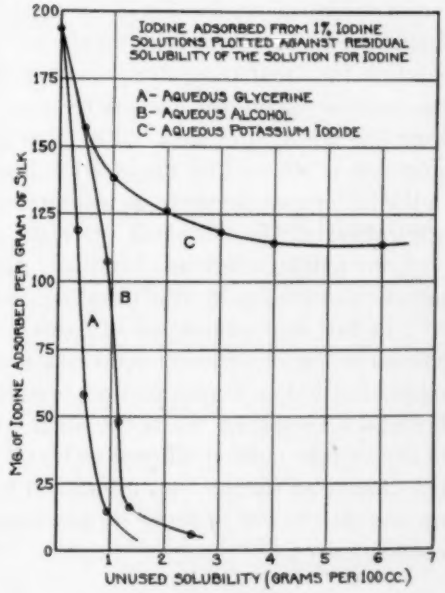

Fig. 4.

tion. Surface behavior is closely related to surface tension effects and for that reason we must first consider the data presented in the light of that important property.

The absolute surface tension of the solution bears but indirectly upon the adsorption of a single constituent upon a surface. That this is true is evident from the fact that aqueous potassium iodide solutions of iodine which differ only *slightly* from aqueous glycerin solutions of iodine, differ *greatly* from them in the degree to which iodine is adsorbed. Also, aqueous alcoholic solutions which *differ* considerably from glycerin solutions in their surface tensions are quite *similar* to them in this respect.

The adsorption coefficient considered from a physical standpoint is a function of two factors: one, the rate of change of surface tension with change of concentration of the adsorbed constituent; and the other, the rate of change of escaping

tendency with the concentration of the same constituent. These quantities are related by the formula $u = \frac{ds/dn}{dF/dn}$, where u is the adsorption coefficient, and ds/dn and dF/dn represent the change of surface tension and of escaping tendency with change of composition, respectively. The change of escaping tendency is not usually considered in studying adsorption effects, but it cannot be entirely ignored unless we are dealing with a perfect or with an infinitely dilute solution. In the absence of experimental data on the escaping tendency of the solutions involving several concentration variables, it suffices for our present consideration to say that, in general, the change of escaping tendency with increasing iodine concentration will have a positive value. It follows, then, that, if the surface tension of the solution is lowered as the iodine concentration is increased, the iodine adsorption coefficient will be increased accordingly. That this is true in aqueous potassium iodide solutions at the liquid-air interface is shown by the fact that 4.5 per cent iodine does effect a lowering of the surface tension of a 5 per cent potassium iodide solution by about three dynes per centimeter. That a similar condition obtains at the liquid-solid interface where the interfacial tension cannot be measured is evident from the adsorption data. The change of surface tension of alcohol and glycerin solutions is affected by dissolved iodine to a less extent, so much less, in fact, that in the latter case accurate measurement is difficult. This finding indicates that the adsorption at the liquid-air interface should be correspondingly less than in the aqueous iodide solutions of iodine. Support to this conclusion is observed in the behavior at the liquid-solid interface, as indicated by the adsorption measurements.

In this limited number of cases it is evident that, even when the quantitative consideration of escaping tendency is ignored, the change of surface tension with increasing iodine concentration permits qualitative prediction of adsorption at a liquid-solid interface where the surface tension cannot be measured. The smallness of the surface tension differences involved and the possibility of differences between the change of surface and interfacial tensions make it plain that direct adsorption measurements are of more significance when a wide variety of solvents are being considered.

SUMMARY.

The wetting power of iodine from aqueous iodide solutions is notably superior to that from alcohol and glycerin solutions.

The wetting power of iodine from aqueous iodide solutions is an approximate logarithmic function of the unused solvent power of the solution for iodine.

Absolute surface tension of the solution has only indirect bearing on the wetting power of a single constituent.

Though the wetting power of a single constituent, depending on the change of surface tension of the solution, and on the change of escaping tendency of the adsorbed constituent with change of composition of the same constituent, may be qualitatively predicted even for complicated concentrated systems, it can in some cases be determined directly with more ease and with accuracy suitable for practical consideration.

PITTSBURGH, PA.

THE BEHAVIOR OF IODINE SOLUTIONS AT LIQUID-SOLID INTERFACES.

II. THE IMPORTANCE THEREOF IN THE PREPARATION OF NEW IODINE ANTISEPTICS.

BY GEORGE M. KARNS,[1] LEONARD H. CRETCHER[2] AND GEORGE D. BEAL.[2]

DEPENDENCE OF DOSAGE UPON PHYSICAL BEHAVIOR.

Antiseptic solutions depend for their effectiveness first of all upon their chemical fitness for the designated purpose, and, in addition, upon the physical behavior that governs the facility with which they reach the surface that is their assigned site of action.[3] The physical behavior is that of a two-phase system in which an antiseptic solution is the liquid part and the bacteria upon which it acts is a solid or gel phase. The dose which the bacterium receives per unit of weight depends upon the concentration of antiseptic agent per unit of area as governed by the physical behavior of the solution and upon the ratio of the surface to the weight of the bacterium itself.

The surface behavior of an antiseptic solution becomes increasingly important when microscopic organisms are considered: as the size of the organism decreases, its volume changes as the cube of its diameter, whereas the surface changes as its square. The surface per unit of weight therefore increases rapidly as the diameter of the organism becomes less, and consequently the surface behavior of the contact agent becomes more and more important. In the past we have assumed that the dose received upon application of a contact medicinal was entirely dependent upon the concentration of the active agent in the solution applied. That this in general is not a valid assumption is evident from a consideration of the question in terms of the physical chemistry of surfaces. That it is not valid in the specific instance of iodine antiseptics is clear from the investigation of adsorption of iodine upon solid surfaces from various types of solution. This paper is presented in an effort to use the available physical and physiological data to prepare a modified iodine antiseptic, taking advantage of these properties to increase its facility and, if possible, its effectiveness in use.

The iodine solutions now in most extensive use may be classified roughly as follows: iodine in volatile solvents, such as the familiar tincture; iodine in solution in non-volatile organic solvents, such as the glycerol preparations of iodine; and, iodine in aqueous solutions of iodides, such as Lugol's solution.

Of these preparations the volatile solvent class represented by the familiar U. S. P. tincture is the most popular, because of the facility with which iodine in such a solvent can be applied and left in place. It has also been thought that the tincture depended for its penetrating power upon the alcohol that it contains. The objection to preparations of this most used type is that as applied in practice they cause irritation to subcutaneous tissue and that they also often cause excessive sur-

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[3] Karns, THIS JOURNAL, 21 (1932), 779.

face irritations, known as iodine burns. The initial irritation giving the pain reaction, usually accepted as characteristic of iodine solutions, may be due to any of the chemical or physical effects of one or all of the several constituents. The excessive irritation causing destruction of tissue is usually due to a lack of adjustment of the dose between the amount of active agent required to give adequate antisepsis and that causing tissue destruction. Dosage is therefore a most important consideration upon which this difficulty depends and it is this factor that we must first consider. The dose applied from a solution in a *volatile solvent* depends first of all on the strength of the solution. This may be readily regulated. It depends finally, however, on the number and depth of the successive puddles of solution that are allowed to *dry* upon the treated surface. This, entirely subject to individual practice, is difficult to control, even when a knowledge of the proper dosage makes possible an intelligent effort to do so. If, however, the solution is *not allowed to dry*, an equilibrium is reached between the antiseptic agent at the surface and in the solution. This concentration ratio has a definite value, depending upon the solution that is applied, and upon the nature of the surface. If it were possible to prepare a solution in which this equilibrium concentration was adequate for germicidal effectiveness, and if this proper dosage would remain after the excess solution was removed, a method of application based upon this equilibrium could be used to insure a certainty of dosage that would be to some degree independent of individual practice.

THE PHYSICALLY DESIRABLE SOLUTION.

The investigation of the adsorption behavior of iodine antiseptics mentioned before, in which the concentrations of iodine at surfaces in several types of solutions have been determined, has given us data from which we can devise an iodine solution basing its dosage upon the equilibrium principle outlined above, which will be most likely to meet the requirements for an antiseptic. It was found that the partial wetting power of free iodine from aqueous iodide solutions is much greater than that from alcoholic solutions of like free iodine strength. For example, it has been found that the iodine dose deposited and adhering to silk fibre from a 3% iodine solution is approximately 10 times as great as that deposited from a solution of like iodine and potassium iodide strength in 70 per cent ethyl alcohol. Glycerin solutions were found to be similar to alcoholic solutions in adsorption behavior. Aqueous iodide solutions which offer the best possibility of securing an adequate and persistent dose of iodine upon a surface, which is independent of the fate of the residual solution, are in turn governed in their behavior by the ratio of iodine to iodide in them. Lugol's solution, which is superior to an alcoholic tincture for this particular type of application, is inferior to a solution of like free iodine strength but containing a decreased amount of iodide ion. We find indeed that by adjusting the ratio of iodide to iodine a 3 per cent solution of iodine can be prepared which will deposit approximately the same amount of iodine on a surface as a 5 per cent Lugol's solution. Assuming that the dose deposited from this 3 per cent aqueous solution is adequate to give germicidal effectiveness, let us recount what we have gained in making such a solution.

First, we have at hand a solution that will give a definite and adequate dose upon a tissue surface that will remain there after the excess of solution is removed.

Secondly, we have eliminated any effects, beneficial or otherwise, that might come from the volatile solvent, such as alcohol.

Thirdly, by decreasing the iodide-iodine ratio we have lowered not only the amount of iodide in the solution, but have also decreased the amount of iodine necessary to deposit a given dose and thereby have materially reduced the chemical and osmotic contributions to pain that the materials would make. In the comparison with 5 per cent Lugol's solution mentioned above, this means an elimination of 40 per cent of the iodine and 70 per cent of the iodide.

THE SOLUTION CHEMICALLY ADJUSTED.

We have by the above considerations made a logical adjustment of the constituents of our solution, eliminating from it, in so far as is possible, those factors which contribute nothing desirable to its physical or chemical behavior.

Those constituents making only an indirect contribution, and which cannot be eliminated, we may adjust further from the chemical standpoint. The most important of these are the positive ions accompanying our indispensable iodide ions. Potassium has been used almost universally in iodide solutions, though it is evident that, if all possible physiological applications of iodine and iodide solutions were considered, a like amount of sodium would be preferable. A solution containing only sodium as its positive metallic ion, having desirable adsorption properties, can be made up to a desired strength using:

Iodine	1.000 part
Sodium iodide	1.180 parts

Indeed, if an iodide solution were to be used in contact with tissue in large amounts for some time, an ion ratio similar to that of the blood would approach the theoretical ideal. Such a solution, theoretically balanced, may be prepared using

Iodine	1.000 part
Calcium iodide hexahydrate	0.044 part
Potassium iodide	0.048 part
Sodium iodide	1.104 parts

The solution can be made to any desired iodine strength in the above ratio.

THE SOLUTION UNDER TEST AND IN PRACTICE.

Clinical trials of solutions of the above type over a period of a year have established the concentrations most suitable for meeting various conditions. For hospital use, for the preparation of operating fields and for direct application to open wounds, a solution of 2 per cent free iodine strength has been found to be most satisfactory. For use in home medicine cabinets and for use in the mouth, 3 per cent strength is to be preferred. In practice, the solution is applied in excess and allowed to remain in place from 15 to 30 seconds. The excess solution may then be removed with absorbent cotton or by washing with water, and the iodine dose will remain behind. A number of arbitrary tests have been made upon solutions of these selected concentrations, and the results thereof will now be recounted along with other properties that have been brought out by clinical observation.

Staining Power.—A striking demonstration of the difference between this aqueous solution and one of similar free iodine strength in alcohol may be made by comparing the amount of iodine remaining on a finger immersed in one solution and washed immediately, with that remaining on a finger similarly treated in the other solution. If the fingers are immersed for 15 to 30 seconds, it will be found after washing with water that a considerable dose of iodine remains on the finger which has been treated with the aqueous solution, while the finger from the alcoholic solution is practically freed from iodine.

Penetration.—The tests of the penetrating power of alcoholic compared with aqueous solutions which have been made, obviously do not duplicate exactly the conditions existing when iodine is applied to live skin or other tissue. They should, however, serve to point out major differences in behavior of the two types of solution. In making the tests freshly prepared dehaired guinea-pig skin membranes were fastened over the end of glass cylinders. The solutions to be tested were placed in tubes suspended in a dilute solution of potassium iodide. Special precautions were taken to maintain the same hydrostatic head with solutions of different specific gravity. The amount of iodine passing through each membrane in a given time was determined by titration. A number of runs alternating the solutions under test were made with each membrane. It was found that with a 3 per cent aqueous solution of iodine the rate of penetration of iodine through the membrane was about twice that of the alcoholic solution of like strength. The difference is undoubtedly due to a combination of physical and chemical causes. Among those that are of interest are the effects of the solvent on the membrane, such as dehydration in the case of the alcohol, and the osmotic effect of the iodide salt in aqueous solution. The difference in iodine concentration at the migrating surface probably plays some part as well.

The fact that the above experiments were made without attempting to remove the natural fat from the skin, makes the test more interesting in the light of the part that the fat solvent action of alcohol has played in the discussions of penetration in the past. Similar determinations of the time required for penetration of alcoholic and aqueous solutions through frog skin, made by an independent investigator, have given results that are in accord with the above findings. In both types of test it was noted that the skin that had been in contact with aqueous solution was much more deeply stained with iodine than that which had been in contact with those containing alcohol.

Pain.—Quantitative estimates of the pain reaction are practically impossible. A wound once treated is so modified that upon receiving a second similar treatment it will not react in the same manner. In addition, we have no standard wound upon which comparisons can be made. Neither do we have a calibrated individual complete in every detail in sensitivity, but completely devoid of pride, whose reactions may be accepted as a standard. Such refinements are not necessary to evaluate the difference between the tinctures and the aqueous solutions, but mention is made of them to demonstrate the futility of attempting to make fine distinctions. Clinical observations of the effect produced by the aqueous solution, while not establishing it as painless, show it to be capable of exhibiting the benefits of iodine without excessive discomfort to the patient.

Iodine Burns.—The efficacy of the controlled dose in preventing iodine burns is

most effectively demonstrated by the fact that after the preparation of fields for abdominal operations no so-called iodine blisters are found, even on the marginal areas where the excess solution from the field collects and usually concentrates.

Effectiveness.—The concentrations mentioned above have been chosen on the basis of their clinical effectiveness, and on further evidence of their bactericidal effectiveness, as judged by accepted means of test. Bacteriological data on the solution in question will be presented with data on other iodine solutions in a later paper by Gershenfeld and Miller. The comparative phenol coefficients of various iodine solutions demonstrate the importance of considering dosage in terms of surface concentration. The aqueous solution in question has a phenol coefficient that is about 15 per cent greater than an iodine solution of like strength made up with alcohol. It is unlikely that this effect is due to the favorable action that alcohol has exhibited on the growth of the bacteria or that it has chemically inhibited the effect of the iodine. When the surface behavior of the iodine in the two solutions is considered, it is more logical to suppose that, even though the alcoholic solution is approaching an aqueous solution at the dilution where the final determination of the phenol coefficient is made, the difference in surface concentration is still appreciable. The importance of surface effects as influenced by the solvent would be much more marked in solutions used without dilution of the solvent. The magnitude of these differences will remain a matter of conjecture pending the development of tests for the bacteriological evaluation of antiseptic solutions under the conditions of use.

ACKNOWLEDGMENTS.

We wish to acknowledge our indebtedness to Dr. Morton S. Biskind, of the Western Reserve University Medical School, Cleveland, Ohio, for making available to us his unpublished work on the penetration of iodine through frog skin. We are also indebted to Drs. G. C. Weil and J. P. Henry, of the Mercy Hospital, Pittsburgh, Pa., for conducting and interpreting clinical observations upon the solutions discussed.

PITTSBURGH, PA.

ISOLATION AND STUDY OF THE SAPONIN CONTENT OF THE JUICE AND LEAF OF THE AGAVE PLANT, MAGUEY, MANSO FINO.*

BY HERMAN D. JONES,[1] WITH THE ASSISTANCE OF G. NELSON FURBECK AND ROUL COLORADO.

The saponin occurs in two groups of agaves which are known as the Amoles and Magueys (1). The leaves and roots of the Amoles are sold in the markets as a substitute for soap because of the ability of the saponin content to lather freely in water. The Magueys are known to the Mexicans as Pita Magueys, Mescal Magueys and Pulque Magueys. The latter are grown in the region of Ometusco in the State of

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[1] This paper is the result of investigations undertaken in Mexico City by the writer while on leave from the Alabama Polytechnic Institute.

Mexico. They are classified as Maguey, Manso Fino (Agave Atrovirens, Karw), and are the ones from which the saponin reported in this communication was obtained.

Saponins are non-nitrogenous glucosides and are abundant in the vegetable kingdom. Aqueous solutions produce abundant foaming upon agitation and are capable of holding in suspension bodies insoluble in water. Aqueous solutions also dissolve the red corpuscles of the blood. The dry powder produces sneezing and irritation of the skin; with sulphuric acid they give a red to violet color.

Almost all the saponins are colorless, amorphous compounds, easily soluble in water, insoluble in absolute alcohol, but as the water content of the alcohol is increased they become more soluble until appreciable quantities are soluble in 70 to 80% alcohol, especially hot 70% alcohol. They are also soluble in methyl and amyl alcohol, and to some degree, in phenol. They are insoluble in such solvents, as ether, petroleum ether, benzol and chloroform.

The saponin in these studies was obtained by three methods. The first one used was that of L. Rosenthaler, in which the saponin was precipitated by lead acetate from the fresh aguamiel and also from the juice by pressing from the fresh leaves. The precipitate was washed and broken up with excess dilute sulphuric acid. The lead sulphate formed was removed by filtering and the last traces of lead acetate were removed from the filtrate by passing in hydrogen sulphide, and by filtering to remove the lead sulphide. The volume was reduced by evaporation over water-bath to approximately the original volume or to a syrupy consistency. This residue was washed thoroughly with hot alcohol, and the alcohol solution separated by decantation. The saponin was then precipitated from the alcoholic solution by the addition of excess ether.

As this was a long process and very small quantities of the saponin were obtained, an attempt was made to obtain the substance in larger quantities. Knowing the solubility of the saponin in 70% alcohol and that large quantities were present in the dry leaves of the Maguey, Manso Fino, it was decided to try to obtain it from this source.

The dry leaves were powdered and the powder passed through a 40-mesh sieve to separate it from the fibre. This powder was then extracted thoroughly with hot, distilled water. Large quantities of the saponin and also of the gums were obtained. The solution was cooled and the gums removed by fractional precipitation with 96% alcohol, each time the excess alcohol being removed by distillation over water-bath and under vacuum, and the volume of the solution reduced. After removing all the gums, the residue, which was largely an alcoholic solution, was treated with excess ether, which caused the precipitation of large quantities of saponin. This method has the disadvantage that large quantities of the gums, very soluble in hot water, are obtained and much time is required to remove them before precipitation of the saponin.

The third method used was as follows: The dry powder, free from the fibre, was extracted for 24 hours with sulphuric ether to remove all oily and resinous substances.[1] The powder was then removed from the extractor and the last traces of the ether removed by exposing it to the air over large areas. After all the ether had evaporated, the powder was replaced in the extractor and extracted for eight hours

[1] A study of these substances is now being made.

with 70% alcohol. Small quantities of the gums present, being soluble in water, came down with the saponin. The larger quantities, however, remained in the powder, being insoluble in alcohol. After the extraction was completed, the traces of gum were removed by adding 96% alcohol in excess. The solution was filtered to remove the precipitated gum. The excess alcohol was then removed by distillation over water-bath and under vacuum. The residue was cooled and excess ether added. Large quantities of the substance were obtained by this procedure.

In each method used, the precipitated saponin required 24–36 hours to settle to the bottom of the container. The excess ether and alcohol were then poured off. The saponin, as obtained after precipitation, carries some ether and alcohol, which tend to hold it in the form of a heavy solution. This is placed in the oven at 35°–40° and allowed to remain until perfectly dry. The residue is then broken up and powdered, the resulting substance being a light, tan-colored amorphous powder.

CHEMICAL AND PHYSICAL STUDY.

Light tan, amorphous powder. Absorbs moisture on standing.

Melting point—decomposes, turning dark brown.

With sulphuric acid, turns dark red.

With sulphuric acid and potassium permanganate, decolorizes the permanganate solution completely, also from a solution to which sulphuric acid has been previously added and the red color fully developed on addition of permanganate, the color completely disappears. p_H-5, Hellige Comparator, methyl red indicator.

Solubility—completely soluble in water; slightly soluble in 96% alcohol, easily soluble in hot 70% alcohol; insoluble in ether and petroleum ether.

Has rather bitter, acrid, unpleasant taste, producing a free flow of saliva.

Produces irritation when rubbed on the skin and slightly attacks the mucous membranes of the nostrils.

Analysis for Elements.—Nitrogen, sulphur, phosphorus and halogens negative; calcium, carbon, hydrogen present.

Calcium is found to be present in quantity of 0.41%.

Combustion Analysis.—On combustion, analysis showed carbon 48.44%; hydrogen, 7.2%; oxygen calculated 43.95%, giving an empirical formula of C_2H_3O. On calculating for the molecular weight by the boiling point method, it was found to be approximately 690. This gives a molecular formula of $C_{32.4}H_{48.6}O_{16.2}$. When making this to whole numbers to the nearest decimal, it becomes $C_{32}H_{49}O_{16}$. When comparing this with the formula as worked out by Noyes, it is found that there is a difference of H_3O, as Noyes gives the formula $C_{32}H_{52}O_{17}$. This error is probably due to the presence of the calcium, which has a tendency to hold back carbon and oxygen. This analysis was checked three different times, obtaining the same results each time. On referring to the literature, it is found that there are two general formulas given for saponins, $C_nH_{2n-10}O_{18}$ (Flückiger) and $C_nH_{2n-8}O_{10}$ (Kobert). It is obvious that the formula as determined for this saponin conforms more nearly to Flückiger's than Kobert's.

The method used for making the combustion analysis is given below. The dry saponins are very hydroscopic and care was taken to prevent the absorption of any water in making the analysis. The saponin was placed in a desiccator over sulphuric acid for 48 hours before making the analysis, the container being a ground

glass, stoppered weighing pan. On commencing the analysis, the desiccator was opened quickly and the weighing pan immediately closed. It was then placed on the balance and the weight recorded. A small quantity was removed from the weighing pan and transferred to a boat previously prepared, containing a mixture of lead chromate and potassium bichromate. The saponin was immediately covered with another layer of the chromate mixture and placed in the combustion tube. The entire process of transferring and placing in the tube required not more than 30 seconds. The combustion was carried on from this point in the usual manner.

HEMOLYTIC ACTION.

The hemolytic action of the saponin was tested according to the method given in the German Pharmacopœia. Fresh blood was taken from a rabbit and defibrinized. One cc. of the defibrinized blood was diluted with 49 cc. of sterile, physiologic salt solution; 5 cc. of this blood solution was placed in each of seven small test-tubes of equal size. The first and seventh were used as controls, to each of which was added 5 cc. of physiologic salt solution. To the other five tubes of the series was added 1 cc., 2 cc., 3 cc., 4 cc., 5 cc., respectively, of the saponin solution and 4 cc., 3 cc., 2 cc., 1 cc. and 0 cc., respectively, of the physiologic salt solution. The saponin solution was made so that 1 cc. contained 10 mg. of the saponin. In the control tubes, there was 10 cc. of blood diluted to 1% and the other five tubes contained 10, 20, 30, 40 and 50 mg. of the saponin.

Results.—Slight hemolysis was noted immediately. The first four tubes showed complete hemolysis in 2 to 3 hours, print being perfectly legible through the tubes in that time, whereas the controls showed none, even at the end of 24 hours.

HEMOLYTIC ACTION OF THE SAPONIN IN THE WHITE RAT.

The saponin was given orally to five white rats, weighing 153 Gm., 120 Gm., 152 Gm., 150 Gm. and 115 Gm., respectively. The first animal received 20 mg., the second 30 mg., the third 50 mg., the fourth 63 mg. and the fifth 84.5 mg., after an original blood count had been made on each animal. At the end of 30 minutes after the administration of the saponin a second blood count was made on each animal, followed by additional counts at intervals of 15 minutes.

Results:

	Animal No. 1.	Animal No. 2.	Animal No. 3.
1st count Before injection	8,760,000	8,448,000	8,576,000
2nd count 30 min. after injection	7,456,000	6,800,000	7,578,000
3rd count 45 min. after injection	7,466,000	5,800,000	7,220,000
4th count 1 hour after injection	7,376,000	5,420,000	6,880,000

In animals No. 4 and No. 5 counts were made over a period of several days in order to establish their normal blood count before actually beginning the experiment.

Results:

NORMAL COUNTS.

Date.	Animal No. 4.	Animal No. 5.
May 7th	8,026,665	8,340,000
May 9th	8,448,000	8,224,000
May 10th	8,160,000	8,144,000
May 13th	8,120,000	8,040,000

Results:

	Animal No. 4.	Animal No. 5.
Normal count	7,649,000	8,395,000
On day of injection		
2nd count	4,781,000	4,675,300
30 min. after injection		
3rd count	5,354,600	5,061,600
45 min. after injection		
4th count	5,927,400	5,720,000
1 hour after injection		

Results:

No change in the animals was noted by the observers. The saponin given did not produce vomiting and did not seem to affect the nervous system and did not cause diarrhea. But it is seen from the above results that the red blood cell count was reduced.

HEMOLYTIC ACTION OF SAPONIN WHEN ADMINISTERED SUBCUTANEOUSLY.

White rats, two in number, were injected subcutaneously with 40 mg. each of the saponin.

Results:

	Animal No. 6.	Animal No. 7.
1st count	7,968,000	8,000,000
Before injection		
2nd count after injection	7,080,000	5,808,000
3rd count, 45 min.	4,880,000	5,800,000
4th count, 1 hour	5,280,000	7,784,000

Systemic Action.—The nervous system of animals in these two experiments was greatly affected. They were unable to control the leg muscles or walk, but hopped. At the end of one hour the hind legs of animal No. 6 were completely paralyzed and it was in a semi-comatose state, insensible to touch, with heart action greatly accelerated. The flow of blood in extremities had practically ceased. After approximately two and a half hours it began to be slightly sensitive to touch. After three hours it showed slight signs of activity and better control of limbs. After twelve hours it was still inactive but control of leg muscles was slightly better. The general condition was much improved over that of first two and a half hours. However, this condition did not persist, the animal taking no food and having no excretions. Thirty-six hours later it developed slight convulsions occurring at intervals of 15 to 20 minutes. Heart action had greatly decreased. The entire body had become cold, and weakness increased until the animal, unable to stand, lay on its side in the cage in a paralytic condition. Forty-four hours after the injection the animal was in a comatose state and died during the night.

Animal No. 7 showed greater resistance. At the end of 15 minutes there was little sign of nervous disturbance but at the end of 45 minutes, the hind legs were paralyzed, extremities of the body were insensible to touch and the blood flow

ceased. Twenty-four hours later the animal seemed to have recovered from the paralytic effect and began to eat, but had developed diarrhea. This condition lasted for six days. On the last day the animal was active and playing in its cage. At about ten-thirty he was noticed to be lying on his side completely paralyzed. This condition lasted about eight hours, until death occurred.

HEMOLYTIC ACTION OF THE SAPONIN WHEN INJECTED INTRAVENOUSLY IN A RABBIT.

A rabbit weighing 2018 Gm. was injected in the marginal ear vein with 80 mg. of saponin. This animal had been under observation for five weeks.

Results:	First blood count before injection	5,008,000
	Second—30 min. after injection	2,496,000
	Third, 1 hour 10 min. after injection	5,072,000

It is seen from these experiments that there was a large decrease in blood cell count in the first half hour, but also the cells seemed to be replaced in the blood stream within an hour and ten minutes.

Forty minutes after the injection of the saponin, the animal voided 50 cc. of bloody urine. Under microscopic examination no red corpuscles were found, but on testing for occult blood, it was found to be positive.

The nervous system was affected but not so severely as in experiments No. 6 and No. 7. This might have been due to the fact that the injection was not sufficiently strong for the larger animal, which might also have had greater resistance than the rats, even though the blood count was greatly decreased. There was twitching of the muscles of the entire body, with loss of control of head muscles. The animal was inactive for practically two hours, but three hours after the injection seemed to be recovering and was more or less active. There was no vomiting, no diarrhea and no more blood in the urine.

DISCUSSION.

In consulting the pharmacology of the saponins (2), (3), it is observed that these substances have a tendency to alter protoplasmic surface tension and have a special affinity for cholesterol.

The results as obtained might indicate that there was true hemolysis. Yet, when it is noted that the blood count began to increase after intervals of approximately 45 minutes to one hour, it is possible that the cells were not actually destroyed but were withdrawn temporarily from the blood stream by the liver, spleen, bone marrow and other organs of the body. After the body had built up a resistance to the toxic effect through the action of the lecithin and cholesterol, it is possible that the blood cells were again returned to the blood stream. However, it is seen that there was complete hemolysis *in vitro* and it is also seen that there was a true positive test for occult blood in the urine voided by the rabbit, indicating apparently that there was true hemolysis in this case. From these facts, one would be more inclined to believe that there was true hemolysis *in vivo*.

When the saponin was given orally in appreciable quantities, it did not produce such violent effects as when administered by injection. This might be due to the protective effect of the digestive juices or to the fact that the saponin was absorbed more slowly when taken orally than when placed in close proximity to the blood stream.

SUMMARY.

The observed effects of saponin herein reported are as follows: It has some hemolytic action, it does not produce nausea, but does affect the nervous system, and produces diarrhea when given by injection. The leaf juice and fresh aguamiel contain very small quantities of the saponin.

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QUALITY OF JAPANESE PEPPERMINT OIL PRODUCED IN FLORIDA.*[1]

BY. B. V. CHRISTENSEN AND LOVELL D. HINER.

It appears that the cultivation of Japanese peppermint (*Mentha arvensis var. piperescens*) was first begun on the island of Hondo, and for many years the industry was restricted to this area. Late in the 19th Century, immigrants from Hondo to the more northern island of Hokkaido carried with them propagating stock from the mint fields of their native land. With this stock they established the first mint plantations in Hokkaido, which by 1906, had so far surpassed Hondo in Japanese mint oil production that it produced about 92% of that produced in Japan. For many years Japan has produced a large proportion of the world's supply of natural menthol and this product has been one of its most important commercial commodities.

Just how and when Japanese peppermint was introduced into the United States is not certain. However, during the past ten or twelve years cultural experiments have been carried on in various parts of the United States.

A few years ago an experimental plot was established at Mont Verde, Florida, by an industrial concern, using large quantities of natural menthol, apparently for the purpose of determining the best location in the United States for the cultivation of this plant to furnish their needs. This project was discontinued in 1926 on account of the low menthol content of the oil and apparently this firm decided that Florida was not the location in which to attempt cultivation on a large scale. This, with one or two other attempts, seemed to convey the impression that the results obtained in the hotter sections of the United States, such as Florida, indicated that Japanese mint oil produced in these sections ran low in menthol. It was also supposed that the menthol content gradually decreased from year to year and that the percentage of combined menthol was relatively high.

The Bureau of Plant Industry in Washington, D. C., became interested in the possibilities of this plant and in February 1927, it was proposed by A. F. Sievers of that Bureau that the College of Pharmacy, University of Florida, coöperate with the Bureau of Plant Industry in carrying out cultural tests in Florida with Japanese peppermint. Rootstock was furnished by the Bureau and the first planting was

* Produced in Medicinal Plant Garden, University of Florida.
[1] Scientific Section, A. PH. A., Miami meeting, 1931.

made in the spring of 1927. From this parent stock, identical and clean strain has been kept and in the tabulations which follow is designated as "Washington." Due to a lack of distilling equipment, the crops produced in 1927 were dried and shipped to Mr. Sievers for distillation and analysis of the oil. Later, crops were distilled here and samples of oils were sent to Mr. Sievers for analysis. These oils were also analyzed in the pharmacognosy laboratory, U. of Fla., and results were exchanged with Mr. Sievers for checking.

In the spring of 1928, rootstock of Japanese peppermint was also obtained from G. A. Russell of Greensboro, North Carolina. From this parent stock identical and clean strain has also been preserved and the results of tests as indicated in the following tabulations are designated "North Car."

TABLE I.—YIELD AND PROPERTIES OF JAPANESE PEPPERMINT OIL (WASHINGTON STOCK).

	1927.*	1928.*	June. 1929.	Oct. 1929.	July. 1930.	Oct. 1930.
Per cent yield (dry basis)	2.81	1.37	.....	.....	.....	.....
Per cent yield (green basis)	.....	0.292	0.424	0.557	0.331	0.419
Yield, oil per acre (lbs.)	.....	21.5	29.4	4.6	29.3	5.9
Sp. gr. at 25° C.	0.8953	0.8934	0.8929	0.8927	0.8958	0.8943
Index refraction at 20° C.	1.4598	1.4586	1.4556	1.4569	1.4536	1.4530
Opt. rotation at 25° C.	.....	−38.92	−38.35	−38.31	−34.15	−34.74
Sap. No.	22.4	11.4	12.62	17.05	18.55	18.32
Free menthol (%)	65.56	69.10	68.45	66.75	69.19	59.93
Combined menthol (%)	6.24	3.90	3.50	4.73	5.11	5.04
Total menthol (%)	71.80	73.00	71.95	71.48	74.30	64.97

TABLE II.—YIELD AND PROPERTIES OF JAPANESE PEPPERMINT (NORTH CAROLINA STOCK).

	1928.*	June. 1929.	Oct. 1929.	1930.*
Per cent yield (green basis)	0.376	0.482	0.339	0.180
Yield, oil per acre (lbs.)	21.78	15.6	5.00	8.00
Sp. gr. at 25° C.	0.8981	0.8933	0.8935	0.8951
Index refraction at 20° C.	1.4774	1.4607	1.4616	1.4541
Opt. rotation at 25° C.	−39.68	−37.44	−38.60	−38.15
Free menthol (%)	66.95	62.25	64.40	64.10
Combined menthol (%)	4.9	3.51	3.38	3.75
Total menthol (%)	71.85	65.76	67.78	67.85

* Crops combined for distilling because of small quantity of material.

DISCUSSION.

According to *Schimmel Report*, 1924, page 67, the average percentage of menthol in some Japanese mint oils produced in New York was 73. From data recorded by Finnemore, "Essential Oils," page 779, on oils produced in Japan it appears that the menthol content ranges from 78 to 92%.

The average menthol content of Japanese mint oils produced thus far, as indicated in Tables I and II, from Washington stock is 71% and from North Carolina stock is 67%. From this it appears that the menthol content of oils produced in this locality does run a little lower than that of oil produced in other sections.

It does not appear from the data above that there is a gradual decrease from year to year in menthol content. The data does indicate seasonal variations, which

occur in all localities. The menthol content, therefore, appears to be consistently maintained.

According to Finnemore, page 779, the range of menthol as esters in mint oil produced in Japan is from 1.5% to 7%. In Florida oils the menthol as esters falls within this range. Neither does the data indicate a gradual increase in combined menthol, as has been supposed to be the case. It further appears that the percentage of combined menthol of oils produced here is lower than that of oils produced in northern sections of U. S., where it has ranged in some instances from 6 to 11%. From this it appears that the combined menthol in southern oils is relatively low.

The yield of oil per acre is very low in this locality. Theoretically the annual yield per acre should be high, due to the possibility of producing two crops on account of the long growing season. However, it is to be noted that the second crop has been consistently very small and field observations indicate that this plant is inclined to rest after the first harvest and does not produce a vigorous growth during the latter part of the season. Field data also indicates that this plant gradually weakens from year to year. From both Washington and North Carolina stock, the first crops were healthy and vigorous. During the past and present seasons the stand was very poor and plants apparently very much weakened. This may be partially due to soil conditions as well as seasonal conditions, but there is considerable evidence which indicates that the plants do not adapt themselves well to the hot climate.

CONCLUSIONS.

1. Indications are that the menthol content of Japanese peppermint oils produced in the South is somewhat low.
2. No indication of a gradual decrease in menthol content from year to year.
3. The menthol as esters appears to be relatively low in Japanese mint oils produced in this locality.

THERAPY IN HOSPITALS.

"Physical Therapy in Hospitals for Veterans" was one of the subjects of the session of the Council on Medical Education, Licensure and Hospitals, at which Dr. Harry E. Mock, chairman of the Council on Physical Therapy, American Medical Association, presided. The subject of the first paper was "Physical Therapy in Army Hospitals." The paper was written by Dr. Patterson, Surgeon General of the United States Army, and read in his absence by Dr. Garrey. Dr. MacEachern discussed the paper. Both the paper and the discussion stressed the importance of physiotherapy and emphasized the fact that this treatment should be under the direction of a competent medical man. It deplored the fact that in many instances this treatment is being used by untrained and uninformed individuals who may do a great deal of harm by its unwise use.

The second paper, "Occupational Therapy, Its Aims and Developments," was read by Mr. Thomas B. Kidner, of New York. Mr. Kidner told of the growth of occupational therapy, and said that a very important step has been taken by the American Occupational Therapy Association in the establishment of a registry of qualified occupational therapists to which any doctor or hospital superintendent may refer with the assurance that any person on the registry is capable. Mr. Kidner said that standards were established before any attempt was made to register any one, and that a great deal of difficulty had been avoided by this procedure. Dr. Gaenslen of Milwaukee, and Dr. Clopton of Hines, Ill., discussed the paper, agreeing in the main with what Mr. Kidner had said. Dr. Coulter, of Northwestern University, raised the question of the commercial aspect of occupational therapy in Veterans' Hospitals.

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SWITZERLAND REGULATIONS APPLYING TO NEW NARCOTIC DRUGS.

Under Swiss legislation now in force the control of the trade in narcotic drugs has been extended to cover acedicone (acetylodihydrocodeinone or acetylodemethylodihydrothebaine) and its salts as well as all preparations containing acedicone or its salts; codeine (methylmorphine) and dionine (ethylmorphine) and their salts. These products, therefore, now require a license in order to be imported into or exported from Switzerland.

AN EXPERIMENTAL STUDY OF THE DETERIORATION AND ASSAY OF SPIRIT OF ETHYL NITRITE.*[1]

BY MARVIN J. ANDREWS.

INTRODUCTION.

Spirit of ethyl nitrite in the generally accepted sense is a solution of ethyl nitrite in strong alcohol. Although universally used in medical practice, the preparation is unsatisfactory as it undergoes rapid deterioration.

Since the first mention of a preparation of this nature in the literature by Raymond Lully in the 13th century, and subsequently by Basil Valentine in the 15th century (1), numerous efforts have been made to improve the keeping qualities of this product and thereby insure the uniformity of its potency. The efforts made along this line have in the main followed one of three courses, *viz.*, alteration of the method of preparation, addition of preservatives to the finished product, storage under special conditions.

Inasmuch as all three above-mentioned courses seemed to present opportunities worth studying, the experimental work undertaken and which is reported herein follows along these lines.

REVIEW OF WORK OF OTHER INVESTIGATORS.

Causes of Deterioration.—The deterioration of the spirit of ethyl nitrite consists in the main of the hydrolytic splitting of the ethyl nitrite with subsequent oxidation of the hydrolytic products and the re-union of some of these to form new compounds.

The normal constituents of the spirit are, ethyl nitrite, alcohol and water. On standing sensible amounts of nitrous, nitric and acetic acids are developed, also aldehyde, ethyl acetate and ethyl nitrate. Other compounds which have been identified in samples of the spirit examined and reported by various investigators are ethyl oxide, ethyl formate, ethyl oxalate, cyanides, glyoxal, glyoxalic acid, oxalic acid, malic acid and saccharic acid (2). Allen has also reported the presence of nitroethane, a substance isomeric with ethyl nitrate (3). The decrease in strength of the spirit is due to evaporation of ethyl nitrite as well as to the decomposition of the latter.

The exact conditions responsible for the destruction of the ethyl nitrite are not thoroughly understood, but it is established that the presence of an excess of water favors decomposition and that this decomposition is accelerated by exposure to air, sunlight and heat. The causes of decomposition as reported in the literature are as follows:

TABLE I.—REPORTED CAUSES OF DETERIORATION.

Year.	Investigator.	Cause of Deterioration.	Reference.
1823	Funcke	Addition of neutral potassium tartrate which causes the ethyl nitrite to separate from the spirit.	*Archiv. d. Pharm.*, 4, p. 344.
1824	Flashoff	Action of sunlight.	*Archiv. d. Pharm.*, 7, p. 61.

* From the laboratory of A. G. DuMez, Professor of Pharmacy, School of Pharmacy, University of Maryland. Thesis submitted to the Faculty of the Graduate School of the University of Maryland in partial fulfilment of the requirements for the degree of Master of Science.

[1] Section on Practical Pharmacy and Dispensing, A. PH. A., Miami meeting.

Year.	Investigator.	Cause of Deterioration.	Reference.
1827	Flashoff	Tendency to become acid.	*Archiv. d. Pharm.*, 21, p. 222.
1831	A. Duflos	Action of water.	*Archiv. d. Pharm.*, 36, p. 279.
1856	Kolbe	Water and oxygen of the air, producing nitrogen tetroxide, nitrous acid and nitric acid.	"Kolbe's Organ. Chem.," *Archiv. d. Pharm.*, 138, p. 164.
1885	G. E. Perry	High temperatures.	*Pharm. Jour.*, 45, p. 125.
1886	R. G. Eccles	Storage in large, partially filled containers.	PROC. A. PH. A., 34, p. 175.
1887	G. A. Atkinson	Water.	*Pharm. Jour.*, 47, p. 271.
1887	A. B. Lyons	Partially filled containers.	PROC. A. PH. A., 35, p. 624.
1893	Gibson	Glycerin in time, because of hygroscopic nature.	*Pharm. Jour.*, 52, p. 700.
1894	H. W. Jones	Water and evaporation.	*Pharm. Jour.*, 54, p. 163.
1894	Simpson	White bottles for storage.	*Pharm. Jour.*, 54, p. 163.
1894	J. S. Ward	Water.	*Pharm. Jour.*, 54, p. 164.
1900	Wilbur L. Scoville	Action of water in alcohol.	*Proc. Mass. State Pharm. Assoc.*, 1899, 53; PROC. A. PH. A., 48 (1900), 512.
1900	F. W. Pittuck and G. F. Merson	Evaporation and diffusion on continuous opening of bottle.	PROC. A. PH. A., 48 (1900), 511.
1902	S. F. Burford	Diffusion due to imperfect stoppering.	*Chem. & Drug.*, July 20, 1901, 108, through PROC. A. PH. A., 50 (1902), 749.
1902	E. H. Farr and R. Wright	Diffusion in partially filled bottles. Direct sunlight is fatal, but diffused light, however bright, has no chemical action on spirit.	*Trans. Brit. Pharm. Conf.*, 1901, 447, through PROC. A. PH. A., 50 (1902), 748.
1903	G. E. Shaw	Diffusion in partly filled, large bottles. Action of direct sunlight.	*Pharm. Jour.*, 8 (1903), 236; PROC. A. PH. A., 52 (1904), 564.
1911	Linwood A. Brown	Effect of actinic rays of light, volatilization, hydrolysis. Acid produced on standing accelerates deterioration.	*Amer. Drug.*, 10 (1911), 215; PROC. A. PH. A., 1911, 94.
1912	Southall's Report	Volatilization by mere pouring from one bottle to another. Hydrolysis practically nil in ten months.	*Southall's Report*, 1912, 20, 43, through "Brit. Y. B.," 1912, 335.
1913	R. C. Crowley	Evaporation in hot climates and hydrolysis when prescribed in aqueous solution.	"Proc. Austral. Pharm. Conf.;" *Austral. Jour. Pharm.*, 28 (1913), 19, through *Y. B., Brit. Phar. Assoc.*, 1913, 362.
1914	E. H. La Pierre	Heat, light and moisture.	"Proc. Mass. Phar. Assoc.," 1914, 88, through Y. B., A. PH. A., 3 (1914), 86.
1914	T. R. Hodgson	Evaporation in open and stoppered bottles.	*Pharm. Jour.*, 92, 28, through A. PH. A., 1914, 87.
1915	C. R. Marshall and Elizabeth Gilchrist	Evaporation in partially filled bottles, and opening bottle frequently.	*Brit. Med. Jour.*, 2 (1915), 125, through *Y. B., Brit. Phar. Assoc.*, 1916, 303.
1927–28	Senior Class of University of Philippines.	Air, light, water and kind of container.	*Jour. Philippine Phar. Assoc.*, Vol. 1, September 1928, 24.

The fact that the deterioration of the spirit is due in a large measure to the presence of water and is hastened by exposure to air, sunlight and high tempera-

ture, is fairly well established by the foregoing reports. It is confirmed by the results of the additional studies reported herein.

Methods Suggested for Preventing Deterioration.—The methods which have been suggested for preventing deterioration fall into two classes, *viz.:* those having as their main objective the prevention of loss of ethyl nitrite by evaporation, and those intended to prevent or retard destruction of the ethyl nitrite. The specific procedures recommended for accomplishing these purposes are summarized in the following table.

TABLE II.—SUGGESTED METHODS FOR PREVENTION OF DETERIORATION.

Year.	Investigator.	Preservative.	Reference.
1824	Flashoff	Spirit agitated for 18–20 days with MnO_2 and distilled slowly over MgO, does not become acid.	*Archiv. d. Pharm.*, 7, p. 61.
1824	Flashoff	Doubles amount of MnO_2 and prevents spirit from becoming acid.	*Archiv. d. Pharm.*, 9, p. 331.
1824	Th. Martius	Spirit distilled over KOH does not become acid within 6 months.	*Archiv. d. Pharm.*, 9, p. 331; *Buchn. Report.*, 15, p. 71.
1827	N. E. Henry	Magnesia, ferroso-ferric oxide, iron and copper prevent acidity when left in contact with spirit.	*Jour. de Pharmacie*, 13, p. 119.
1831	Braun	Shake with K_2CO_3 or MgO and keep over $CaCl_2$ to prevent acidity.	*Chem. Centribl.*, 2, p. 192.
1847	Klauer	Distilled over neutral potassium tartrate, yields a less acid product.	*Chem. Centribl.*, 19, p. 640.
1850	G. Reich	Acidity prevented by treating with neutral potassium tartrate, then preserving over calcium chloride or storing in 2- or 4-oz. bottles covered with gutta-percha.	*Archiv. d. Pharm.*, 112, p. 148.
1870	C. J. Rademaker	Potassium bicarbonate crystals, not so good tends to form nitrite.	*Am. Jour. Pharm.*, 42, p. 106.
1877	F. M. Rimmington	Strong alcohol essential to prevent decomposition.	*Pharm. Jour.*, 37, p. 453.
1885	W. H. Symons	Small bottles, well stoppered (paraffin covered) capped, wrapped in dark paper and stored in cool place.	*Pharm. Jour.*, 45, p. 164.
1886	J. Williams	Glycerin $^1/_3$, absolute alcohol $^2/_3$ as solvent.	*Pharm. Jour.*, 46, p. 255.
1887	G. A. Atkinson	Glycerin and acetate or citrate of ammonia retard decomposition.	*Pharm. Jour.*, 47, p. 271.
1888	T. S. Dymond and W. R. Dunstan	Absolute alcohol with 5% glycerin, best solvent.	*Pharm. Jour.*, 47, p. 790.
1892	W. Kinzel	Preserved over potassium tartrate.	*Pharm. Centrlhl.*, 33, p. 677.
1893	A. Meldrum	Addition of 10% glycerin.	*Chem. & Drug.*, 1893; *Amer. Jour. Pharm.*, 65, p. 199.
1893	Merck's Report	Sodium bicarbonate, potassium tartrate, magnesium carbonate, potassium bicarbonate have been used to neutralize the acid.	*Merck's Report*, 2, p. 22.
1893	Editor	Potassium tartrate best agent to preserve spirit.	*Pharm. Centrlhl.*, 34, p. 400.
1893	I. W. Thomson	5% glycerin in absolute alcohol is as stable as 10% glycerin in absolute alcohol.	*Pharm. Jour.*, 52, p. 699.

Year.	Investigator.	Preservative.	Reference.
1893	Gorrie	Preservative action of glycerin limited as to time (2 years).	*Pharm. Jour.*, 52, p. 700.
1893	Cowie	Glycerin in spirit acts as a preservative in lubricating the stopper, thus preventing access of air.	*Pharm. Jour.*, 52, p. 700.
1895	W. Smith	10% glycerin probably best preservative, but did not completely diminish loss in strength.	*Pharm. Jour.*, 54, p. 809.
1895	T. Dunlop	Should be kept in dark colored bottles excluded from light and heat.	*Chem. & Drug.*, 46, p. 70.
1898		5% glycerin.	*Pharm. Ztg.*, 43, p. 153.
1899	John Barclay	Sodium bicarbonate slightly retards loss of ethyl nitrite when bottle is well filled.	*Chem. News*, 12, 1899, 1030; PROC. A. PH. A., 48 (1900), 764.
1903	Frank Holman	Addition of simple syrup.	*Canad. Pharm. Jour.*, Aug. 1903, 20; PROC. A. PH. A., 52, 1903, 564.
1903	B. O. Leuber	Absolute alcohol with 5% glycerin. Spirit should be kept in well-filled, small, amber (not blue or green) bottles in a cool, dark place.	*Merck's Report*, Sept. 1902, 344.
1903	P. E. Hommell	Addition of small crystals of $KHCO_3$ to large quantities of spirit. Should be kept in small bottles.	*Proc. of N. J. Pharm. Assoc.*, 73, through PROC. A. PH. A., 51 (1903), 656.
1903	G. E. Shaw	Well-filled, small bottles kept in a cool place.	*Pharm. Jour.*, 8, 1903, 236. PROC. A. PH. A., 52 (1904), 564.
1911	J. Grier	Well-stoppered bottles essential.	*Chem. & Drug.*, 79 (1911), 537. *Y. B., Brit. Pharm. Assoc.*, 1912, 337.
1911	Linwood A. Brown	Spirit made with absolute alcohol stored in small, amber bottles below 10° C.	*Amer. Drug.*, 10, 1911, 215. PROC. A. PH. A., 1911, 94.
1912	Linwood A. Brown	Spirit made with absolute alcohol stored in small, amber bottles below 10° C., protected from light.	"Proc. Ky. Pharm. Assoc.," 1912, 134.
1912	Southall's Report	Glycerin has slight preservative action.	*Southall's Report*, 20 (1912), 43, through *Y. B., Brit. Phar. Assoc.*, 1912, 335.
1912	C. B. Jordan	Should be kept in 1- or 2-oz. bottles tightly stoppered and sealed with paraffin or wax.	"Proc. Ind. Pharm. Assoc.," 1912, 53, through Y. B., A. PH. A., 1 (1912), 58.
1913	R. C. Crowley	Glycerin and absolute alcohol in varying proportions.	Proc. Austral. Pharm. Conf.; *Austral. Jour. Pharm.*, 28 (1913), 19, through *Y. B., Brit. Phar. Assoc.*, 1913, 362.
1913	F. L. Shannon	Store not more than 6 months' supply in small, dark amber bottles in a cool place.	JOUR. A. PH. A., 1 (1913), 83.
1915	C. R. Marshall and Elizabeth Gilchrist	Ethyl nitrate diminishes loss of ethyl nitrite.	*Brit. Med. Jour.*, 2 (1915), 125, through *Y. B., Brit. Assoc. Phar.*, 1916, 303.
1917	T. C. N. Broeksmit	Bulk should be kept neutral by adding excess $MgCO_3$ and stored in a	*Pharm. Weekblad.*, 54 (1917), 1052.

		cool, dark place. For retail use filter and add Na_2SO_3	Y. B., A. PH. A., 6 (1917), 96. *Y. B., Brit. Phar. Assoc.*, 1918, 324.
1921	J. G. Roberts	Completely filled, small, amber bottles.	*Amer. J. Pharm.*, 93 (1921), 324. Y. B., A. PH. A., 10 (1921), 95.

The above suggestions have in the main been made with the best intentions, but the fact remains, that in actual practice the majority of them have been found to be of little or no value, and such of them as have been found to possess merit are only of value in so far as they diminish or retard deterioration. No method has yet been devised which will wholly prevent deterioration, nor has any practical means been found for preserving the product in a satisfactory condition for a reasonable period of time. The methods which have been found to give the best results will be discussed under the experimental work reported herein.

EXPERIMENTAL DATA.

As previously stated the purpose of the experimental work begun some two years ago and reported herein was to determine if it is possible to prepare a spirit of ethyl nitrite sufficiently stable to insure its potency over a reasonable length of time and the conditions which must be observed to give this result. The specific investigations undertaken were a study of the cause of deterioration from the standpoint of the effect of the various solvents used in the preparation of the spirit, the effect of added preservatives, the effect of colored glass containers and other conditions of storage. Incidentally, a comparison was made of the methods of assay as the official method, which is the one in general use in this country at the present time, it is inconvenient and not wholly satisfactory in other respects.

Preparation of Samples.—The spirit used in all of the experiments conducted in this investigation was prepared according to the formula given in the ninth edition of the United States Pharmacopœia (4). It was assayed for ethyl nitrite content immediately after preparation. In those cases where a large number of bottles were filled for use in a series of assays, the spirit was first assayed and then transferred to the various containers, the temperature being maintained below 5° C. during the transfer. Where only a few bottles were filled, the contents of each bottle were assayed separately.

In all cases, the solution was transferred immediately to glass bottles tightly stoppered with the best grade of cork. The stoppers were twisted in where the bottles were placed in the refrigerator or on the laboratory shelf, but were all securely tied in by means of heavy twine when they were placed in direct sunlight. When the stoppers became spongy or in any way affected by the spirit they were replaced by new ones. The term refrigerator in Table IX refers to one cooled by ice, while the same term in all other tables refers to an electric refrigerator. Direct sunlight implies that the bottles were placed on the roof of the laboratory building in such position that they were exposed to the rays of the sun from sunrise to sunset, and exposed to all kinds of weather. To determine the effect of diffused sunlight, the bottles were kept on a laboratory shelf out of the direct rays of the sun.

COMPARISON OF THE EFFECT OF DIFFERENT SOLVENTS ON THE RATE OF DETERIORATION.

Inasmuch as the work of other investigators has shown that the deterioration of the spirit is influenced in some degree by the solvent used in making the preparation, the following experiments were undertaken. The possibilities in this field are necessarily limited on the one hand to those substances in which ethyl nitrite is soluble, and on the other hand to those which have little or no effect on the therapeutic use.

Throughout this series of experiments the strength of ethyl alcohol where used is expressed in percentage by volume. In addition to using 95 per cent ethyl alcohol, which is the solvent specified in the U. S. Pharmacopœia, 99 per cent, 90 per cent and 75 per cent ethyl alcohol were used, the ethyl nitrite content being kept within the pharmacopœial limits, namely, 3.5 per cent and 4.5 per cent (5). Alcohols of these strengths were used to determine the effect of the presence of different amounts of water on the rate of decomposition. The official diluted ethyl alcohol (6) (49 per cent by volume) was also tried, but was discarded as ethyl nitrite was found not to be soluble to the extent of 3.5 per cent therein.

The iso-propyl alcohol used was of the quality labeled chemically pure and obtained from The Coleman & Bell Company, Norwood, Ohio. It was tried because it is free of the legal restrictions surrounding ethyl alcohol, is fairly cheap, possesses solvent properties similar to ethyl alcohol and contains but little water.

Some samples were also prepared with a non-volatile solvent, liquid petrolatum, as it was thought that the rate of evaporation of the ethyl nitrite might be retarded by this means and that hydrolytic decomposition might also be less likely to occur. The heavy liquid petrolatum used was that supplied retail pharmacy. Other non-volatile solvents which suggested themselves, namely, glycerol and ethylene glycol were also tried but it was found that ethyl nitrite was not sufficiently soluble in either of them to justify their use. The following tables give the results of these attempts.

TABLE III.—SOLUTION OF ETHYL NITRITE IN ETHYL ALCOHOL (95%).

Assay Results.

Date.	Refrigerator.[1] White glass, per cent.	Direct Sunlight.[2] White glass, per cent.	Direct Sunlight.[2] Amber glass, per cent.	Diffused Sunlight.[2] White glass, per cent.	Diffused Sunlight.[2] Amber glass, per cent.
7/3/30	4.23	4.23	4.23	4.23	4.23
7/8/30	4.12	0.42*	4.03	3.99	3.98
7/11/30	4.04	0.07	3.99	3.97	3.96
7/16/30	3.99	0.00	3.98	3.90	3.92
8/8/30	3.91	...	3.87	3.80	3.86
9/18/30	3.78	...	3.52	3.76	3.59[4]
12/5/30	3.44*	...	2.66*	3.37*	3.22*,[5]
2/13/31	3.19	...	2.23	3.29	3.07
3/13/31	3.14	...	2.09	3.09	2.98
		Loss of Ethyl Nitrite in Per Cent.			
7/3/30	0.00	0.00	0.00	0.00	0.00
7/16/30	5.68	100.00	5.90	7.81	7.33
3/13/31	25.80	...	50.60	27.00	29.59

* Below U. S. P. minimum requirement.

[1] Kept in refrigerator at 7° C. to 9° C.

TABLE IV.—SOLUTION OF ETHYL NITRITE IN ETHYL ALCOHOL (99%).

Assay Results.

Date.	Refrigerator.[1] White glass, per cent.	Direct Sunlight.[2] White glass, per cent.	Direct Sunlight.[2] Amber glass, per cent.	Diffused Sunlight.[3] White glass, per cent.	Diffused Sunlight.[3] Amber glass, per cent.
7/3/30	4.45	4.45	4.45	4.45	4.45
7/8/30	4.29	1.34*	4.36	4.25	4.36
7/11/30	4.27	0.11	4.27	4.21	4.31
7/16/30	4.26	0.00	4.18	4.15	4.29
8/8/30	4.20	...	3.88	4.08	4.18
9/18/30	4.13	...	3.41*	3.93	4.17
12/5/30	4.09	...	2.86	3.56	4.09
2/13/31	4.00	...	2.73	2.05*,[4]	3.92
3/13/31	3.83	...	2.67	1.95	3.89
		Loss of Ethyl Nitrite in Per Cent.			
7/3/30	0.00	0.00	0.00	0.00	0.00
7/16/30	4.27	100.00	6.07	6.74	3.59
3/13/31	11.68	...	40.00	56.2	12.57

TABLE V.—SOLUTION OF ETHYL NITRITE IN ETHYL ALCOHOL (90%).

Assay Results.

Date.	Refrigerator.[1] White glass, per cent.	Direct Sunlight.[2] White glass, per cent.	Direct Sunlight.[2] Amber glass, per cent.	Diffused Sunlight.[3] White glass, per cent.	Diffused Sunlight.[3] Amber glass, per cent.
7/3/30	4.33	4.33	4.33	4.33	4.33
7/8/30	4.18	0.12*	4.22	4.25	4.21
7/11/30	4.09	0.02	4.17	4.25	4.14
7/16/30	4.05	0.00	4.16	4.01	4.14
8/8/30	4.04	...	4.09	3.86	3.98
9/18/30	3.76	...	3.43*	3.45*	3.60
12/5/30	3.72	...	2.64	3.31	3.21*
2/13/31	3.25*	...	2.60	2.49	2.80
3/13/31	3.14	...	2.09	3.09	2.98
		Loss of Ethyl Nitrite in Per Cent.			
7/3/30	0.00	0.00	0.00	0.00	0.00
7/16/30	6.47	100.0	3.93	7.41	4.17
3/13/31	27.75	...	43.70	53.80	40.00

TABLE VI.—SOLUTION OF ETHYL NITRITE IN ETHYL ALCOHOL (75%).

Assay Results.

Date.	Refrigerator.[1] White glass, per cent.	Direct Sunlight.[2] White glass, per cent.	Direct Sunlight.[2] Amber glass, per cent.	Diffused Sunlight.[3] White glass, per cent.	Diffused Sunlight.[3] Amber glass, per cent.
7/3/30	3.75	3.75	3.75	3.75	3.75
7/8/30	3.69	0.69*	3.58	3.54	3.61
7/11/30	3.55	0.08	3.46*	3.40*	3.46*
7/16/30	3.52	0.00	3.32	3.34	3.27
8/8/30	3.26*	...	2.74	3.06	3.01
9/18/30	3.21	...	2.12	2.89	2.75
12/5/30	3.15	...	1.81	2.26	1.73
2/13/31	2.40	...	1.45	1.29	1.20
3/13/31	2.12	...	1.38	1.29	1.11

[2] Kept out of doors in direct sunlight, both summer and winter, the temperature ranging from 40° C. in summer to −10° C. in winter.

[3] Kept in the laboratory at room temperature at 22° C. to 28° C.

[4] Stopper in spongy condition when removed from bottle.

[5] Stopper broke and part fell in spirit requiring a transfer into another bottle.

Loss of Ethyl Nitrite in Per Cent.

7/3/30	0.00	0.00	0.00	0.00	0.00
7/16/30	6.14	100.00	8.81	10.94	12.79
3/13/31	43.45	...	72.00	60.45	70.5

TABLE VII.—SOLUTION OF ETHYL NITRITE IN ISO-PROPYL ALCOHOL (C.P.).

Assay Results.

Date.	Refrigerator.[1] White glass, per cent.	Direct Sunlight.[2] White glass, per cent.	Direct Sunlight.[2] Amber glass, per cent.	Diffused Sunlight.[3] White glass, per cent.	Diffused Sunlight.[3] Amber glass, per cent.
7/3/30	4.33	4.33	4.33	4.33	4.33
7/8/30	4.31	0.36*	4.20	4.12	4.28
7/11/30	4.19	0.03	4.09	3.99	4.16
7/16/30	4.14	0.00	4.00	3.96	3.87
8/8/30	4.02	...	3.77	3.37*	3.49*
9/18/30	3.93	...	3.17*	3.05	3.09
12/5/30	3.27*	...	2.95	2.71	2.83
2/13/31	3.00	...	2.62	1.11	2.65
3/13/31	2.90	...	2.55	0.91	2.55

Loss of Ethyl Nitrite in Per Cent.

7/3/30	0.00	0.00	0.00	0.00	0.00
7/16/30	4.38	100.00	7.62	8.54	10.61
3/13/31	33.05	...	41.23	79.10	41.23

TABLE VIII.—SOLUTION OF ETHYL NITRITE IN SQUIBB'S LIQUID PETROLATUM.

Assay Results.

Date.	Refrigerator.[1] White glass, per cent.	Direct Sunlight.[2] White glass, per cent.	Direct Sunlight.[2] Amber glass, per cent.	Diffused Sunlight.[3] White glass, per cent.	Diffused Sunlight.[3] Amber glass, per cent.
7/3/30	4.46	4.46	4.46	4.46	4.46
7/8/30	4.23	2.28*	4.19	4.20	4.39
7/11/30	4.18	0.99	4.11	4.14	4.18
7/18/30	4.16	0.00	3.83	3.75	3.87
8/8/30	4.11	...	3.76	3.65	3.74
9/18/30	4.05	...	3.45*	3.59	3.61
12/5/30	3.89	...	3.25	3.29*	3.56
2/12/31	3.33*	...	2.91	3.21	3.35*
3/13/31	3.27	...	2.73	2.69	3.16

Loss of Ethyl Nitrite in Per Cent.

7/3/30	0.00	0.00	0.00	0.00	0.00
7/18/30	6.71	100.00	14.09	15.88	13.21
3/13/31	26.61	...	38.79	39.64	29.04

The results of these experiments show that 99 per cent ethyl alcohol is the best solvent for use under general conditions. It is followed closely by 95 per cent ethyl alcohol, but beyond this dilution the rate of decomposition is so rapid that the preparation is wholly unsatisfactory.

Iso-propyl alcohol proved to be unsatisfactory as Table VII shows, the rate of deterioration of the spirit made with this solvent being about equal to that made with ethyl alcohol of 90 per cent.

Heavy liquid petrolatum as shown in Table VIII indicates that this substance might be a suitable solvent under certain conditions, as the rate of deterioration of the ethyl nitrite in solution is about equal to that of the preparation made with 95 per cent ethyl alcohol. Its principle disadvantage is that it is immiscible with practically all of the preparations that are ordinarily prescribed in

combination with the spirit. It is also unsatisfactory from the standpoint of storage as diffusion of the products of decomposition, as indicated by destruction of cork stoppers, is greater than where ethyl alcohol is the solvent used. The solution prepared with this solvent becomes dark brown and finally black on storage.

COMPARISON OF THE INFLUENCE OF DIFFERENT COLORED CONTAINERS ON THE RATE OF DETERIORATION.

Previous work reported in the literature has shown that exposure of the spirit to sunlight accelerates deterioration, and that this deterioration seems to be directly proportional to the length of time exposed (7). It has further been shown that the actinic rays (8) are the ones most active in effecting decomposition. This being true, it is only logical to conclude that deterioration may be retarded by shielding the preparation from these rays. With this purpose in view, samples of the spirit were stored in bottles made of different colored glass, the colors selected being, blue and amber. The spirit of ethyl nitrite thus bottled was stored side by side with a sample contained in a clear glass bottle for comparison. The results obtained were as follows:

TABLE IX.—SOLUTION OF ETHYL NITRITE IN ETHYL ALCOHOL (95%).

Assay Results.

Date.	Refrigerator.[6] White, per cent.	Refrigerator.[6] Blue, per cent.	Refrigerator.[6] Amber, per cent.	Direct Sunlight.[7] White, per cent.	Direct Sunlight.[7] Blue, per cent.	Direct Sunlight.[7] Amber, per cent.	Diffused Sunlight.[8] White, per cent.	Diffused Sunlight.[8] Blue, per cent.	Diffused Sunlight.[8] Amber, per cent.
8/16/29	4.32	4.32	4.32	4.32	4.32	4.32	4.32	4.32	4.32
8/17/29	...	...	...	3.88	3.94	4.32	...	...	...
8/19/29	4.10	4.18	4.12	3.82	3.74	4.32	4.11	4.19	4.21
8/20/29	...	...	...	3.49*	3.38*	3.94	...	...	...
8/21/29	...	...	...	3.02	3.15	3.86	...	...	...
8/22/29	...	...	...	2.96	2.54	3.84	...	...	...
8/23/29	4.04	4.13	4.09	2.50	2.31	3.82	4.06	4.09	4.04
8/24/29	...	...	...	2.36	2.23	3.76	...	...	...
8/26/29	4.02	4.09	4.06	1.59	1.70	3.71	3.93	3.99	4.03
8/28/29	3.89	3.69	3.97	0.31	0.38	3.65	3.90	3.78	3.94
3/11/30	...	...	...	0.00	0.00	1.71*	3.38*	3.44*	3.46*
				Loss of Ethyl Nitrite in Per Cent.					
8/16/29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8/17/29	...	...	...	10.18	8.8	0.00	...	...	...
8/19/29	5.09	3.24	4.63	11.52	13.41	0.00	4.86	3.04	2.55
8/20/29	...	...	...	19.18	21.65	8.78	...	...	...
8/21/29	...	...	...	30.05	27.06	10.62	...	...	...
8/22/29	...	...	...	31.42	41.16	11.09	...	...	...
8/23/29	6.47	4.39	5.31	42.05	46.50	11.48	6.00	5.32	6.47
8/24/29	...	...	...	45.38	48.40	12.92	...	...	...
8/26/29	6.95	5.32	6.00	63.00	60.50	14.10	9.03	7.62	6.71
8/28/29	9.95	14.50	8.09	92.85	90.95	17.79	9.72	12.48	8.78
3/11/30	...	...	...	100.00	100.00	60.45	21.68	20.28	19.85

[6] Kept in refrigerator at 9° C. to 12° C.

[7] Kept out of doors in direct sunlight, the temperature ranging from 15° C. to 35° C.

The degree of protection afforded by colored glass containers, as revealed in the above experiment, is in the order amber, blue and clear glass. In fact the protection afforded by blue glass is practically nil, as the rate of deterioration of the spirit in blue glass containers is almost as rapid as that in clear glass containers.

(*To be continued*)

DEPARTMENT OF BUSINESS MANAGEMENT

Conducted by Paul C. Olsen.*

COMMENTS, QUESTIONS AND SUGGESTIONS ARE INVITED AND WELCOME.

Readers are invited to submit comments, criticisms and suggestions regarding the material which appears in this department. The Editor will also undertake to answer questions regarding general problems of business management. Letters of general interest will be published, but the writer's name will not be revealed without his permission.

ADVERTISING AND SELLING PROBLEMS OF DRUG STORES.

PERSONAL CHARACTERISTICS OF SUCCESSFUL DRUG STORE SALESMEN.

BY PAUL C. OLSEN.

Imagination is the characteristic which enables a person to visualize that which is not before him and which indeed may never have been before him. It is a characteristic which is exceedingly important to successful drug store salesmen. The drug journals each month contain many instances which show how true this is. Just one group of examples are the facsimile reproductions of queer and odd orders which have been correctly interpreted and properly filled by drug store salesmen.

Imagination, as well as professional knowledge, is required of a drug store salesman when he is asked by a customer for insecticide which will kill roaches. Sodium fluoride is such an insecticide but it is also a poison to human beings. Where there are young children in the house, especially creeping babies, imagination as well as knowledge is required of the drug store salesman who is asked to supply an insecticide to be used under these conditions.

For disinfecting bathroom fixtures a dilution of an antiseptic containing phenol is probably the most effective and the least costly. For oral use, an entirely different type of antiseptic is indicated. Imagination plus knowledge equips able drug store salesmen with the ability to determine when to sell which.

Probably most common of all the experiences which drug store salesmen have in the sale of poisons occurs when a person, usually nervous, asks for a lethal dose of a poison "to kill a cat." Those are the occasions when the knowledge, imagination and human understanding of pharmacists everywhere have prevented murders and suicides—achievements which are to the everlasting credit of the pharmaceutical profession.

Imagination is a useful characteristic of a drug store salesman under many more pleasant conditions. It helps him to assist a love-sick young man in making a selection of the perfume or toilet water which will be most likely to please the young lady of his affections.

Imagination plus knowledge enables the drug store salesman with these characteristics to make a sale of C.P. instead of ordinary sodium chloride to the amateur chemist with a laboratory in his cellar and, at the same time, to win the good-will and enthusiastic interest of such a chemical experimenter by the knowledge and interest shown in his work.

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In the other direction, the tactful but imaginative drug store salesman asks the purchaser of C.P. epsom salts the purpose for which they are to be used. If for a "reducing bath," he tells the customer that commercial epsom salt will serve the purpose as well and at much lower cost. The immediate sale is small but the good-will gained is invaluable. Drug store successes are built upon a long continued series of sales to satisfied customers. One of the easiest ways to keep customers satisfied is to show them safely how to save money.

A characteristic which is closely associated with imagination in successful drug store salesmen is memory. Every experienced druggist can recall encounters with narcotic addicts in which imagination and memory proved themselves invaluable.

Customers are always flattered in a retail store when they are called by name. Memory is the ability to recall that which has previously happened or been experienced. It differs from imagination in that imagination is the ability to call to mind something which not only is not present but may never have been present or experienced. Memory reminds the drug store salesman to ask a customer if she had a pleasant vacation or if a party she had planned had proved to be a success.

A good memory in a drug store salesman is a characteristic which is much appreciated not only by customers but by other people working in the store. It helps to find quickly items which are rarely called for and which are on hand in minimum quantities. It helps to recall whether or not items previously out of stock have been ordered and received and where they have been placed.

There is a danger in depending too much upon memory in the operation of a drug store. It may be a source of pride to a drug store salesman that he never fails to remember to send to a customer every Monday morning the bottle of spring water for which she has a standing order. It is a whole lot better, though, to note this order on a calendar or diary so that it automatically comes to the attention of the people in the store every Monday morning. Some Monday the salesman with the "perfect" memory may be out sick and the customer may not get her spring water.

It is all very well to attempt to carry in one's head the items to be ordered the next time an order is to be given to a wholesale druggist, but the wise thing to do is to write these items in a want book and then to depend on the want book instead of one's memory.

If a person attempts to memorize too much, he has little place left for original creative thinking and for the planning of new and constructive activities. Memory is history. Historians record what has happened. The great progress of the world has not been made by these recorders of what has happened, but rather by the original and creative thinkers whose constructive advances made history worthy of being recorded. What is true of the world in general applies with equal force to the specialized problems involved in successful drug store operation.

Enthusiasm is to an individual what carbonic acid gas is to a sparkling mineral water. It is the characteristic which gives to an individual life and color. The reason that enthusiasm is so important as a characteristic in a salesperson is that it is contagious. A sincerely enthusiastic person can create that enthusiasm in the people to whom he talks. The enthusiastic drug store salesman by the very ardor of his presentation may awaken or create that ardor in his customer, with the result that the customer deems it a privilege to buy from him a motion picture

camera and projector and accompanying supplies, with profit to himself, and the salesman.

Enthusiasm is the characteristic which causes a drug store salesman to approach his duties each day with interest and zest and not merely to regard them as a boresome interlude between breakfast and an after dinner tennis game or a visit to a motion picture palace.

Earnestness is a characteristic which is strikingly like, but basically different from enthusiasm. The basic difference arises from the different source from which the two characteristics are generated. Earnestness is of the mind and enthusiasm is of the heart. Both imply sincere and honest conviction. Earnestness results from conviction following logical reasoning. Enthusiasm results from conviction following instinctive or emotional reactions of combinations of the two. It is basically intuitive, while earnestness is basically logical.

People can be swayed to action by instinctive and emotional appeals. The danger in obtaining responses by this method is that, if these responses do not have a sound and logical basis, even though arrived at by no logical process of reasoning, the person is very likely later—when their influence has waned—to regret his decision and to feel resentment toward the person whose enthusiasm led him to make the decision and consequent purchase. In the case of a purchase of an item in a drug store, this means that the resentment is likely to be felt toward the drug store salesperson and, to even a greater degree, toward the store in which the sale is made.

This is why earnestness should temper the salesman's presentation. Although earnestness is a selling force somewhat less powerful in producing responses than is enthusiasm, it proceeds from a basis which can be subjected to logical and leisured reasoning. Responses are produced most readily in selling by an enthusiastic presentation. When earnestness in the presentation is also employed, earnestness provides the justification for the purchase after the overwhelming but temporary influence of the salesman's enthusiasm has left the customer.

THE FLORIDA SPONGE INDUSTRY.*

BY F. H. HEATH AND P. A. FOOTE.

What is a sponge? A sponge is the cleaned skeleton of a creature that lives attached to the sea bottom. The original name in Greek was *Zoofiton*, meaning half plant and half animal, from the doubt as to which classification it really belonged. About sixty years ago it was definitely established that the sponge belongs to the *Porifera* branch of the animal kingdom. The fresh sponge carries a "skin" over it and inside its pores it is filled with a brown slimy material called "gurry." A microscopic examination reveals that the living substance is composed of protoplasmic cells which in all groups, except glass sponges, surround and penetrate a clear glutinous semifluid intercellular jelly. If brought out of water, even for a short time, the sponge will die.

The sponge reproduces itself by throwing off spores which float about until they attach themselves to some hard substance, such as rock. Sponges may be

* Plant Science Seminar, Miami meeting, 1931.

planted to grow where wanted by cutting off pieces of sponge underwater and tying to a rock. The growth is very slow for the first four months, after which the sponges rapidly enlarge at the rate of $^1/_3$ inch a month. The wool sponge attains a weight of $^1/_{10}$ pound in six months and reaches a size of commercial value in a year. After a sponge is six inches in diameter the next inch is worth the most. Sponges six to eight inches in diameter are most in demand. Sponge growth is like bank interest; if they are not gathered at any particular time they will be that much larger when harvested.

The commercial sponge-producing areas of the world involve the eastern Mediterranean Sea, the Red Sea, the Torres Straits of Australia, the west coast of Australia near Port Phillip, the Philippine Islands, the waters of the Caribbean, especially in the lagoons of Bermuda and the Gulf of Mexico. The best sponge fishing in the Western Hemisphere is along the west coast of Florida off Carabella, St. Marks, Cedar Key, Tampa and Tarpon Springs. The best sponges are collected from 100 to 200 miles off shore here at a depth of 50 to 150 feet. The Florida operations are carried on through the little city of Tarpon Springs, which lies at the mouth of the Anclote River on the Gulf of Mexico, twenty-eight miles northwest of Tampa. Its semi-tropical location and the bayous from the Gulf give the city a charm, especially with its Greek population, possessing a Mediterranean note.

Fig. 1.—Drying sponges on the boat.

Tarpon Springs has a considerable proportion of Greeks among its citizens. The sponge trade is entirely dependent upon them. The divers who gather sponges under the water are all Greeks. Some two years ago the Florida sponge industry needed more divers. As a consequence, a special act of Congress was passed to permit more Greek divers to enter the United States.

The Greeks of Tarpon Springs have brought with them many of the ancient customs of their native land. Their coffee shops witness many business deals while men talk, smoke and drink coffee.

The Greek Catholic Church has a large congregation in Tarpon Springs. Services are held in the Greek and Latin languages. Elaborate and beautiful ceremonies are held at New Year's and at Easter. Since the Greek Church uses the old-style calendar, the ceremonies occur in January and May. At New Year's a golden cross is cast into the water of a bayou while the church officials conduct services on shore. Boys dive for the cross. If recovered, it means safety for the fleet and the boy is blessed by the Bishop. At Easter the Greek Church conducts services which last all day and until past midnight. The church is draped in mourning and the bell tolls all day. In the church is a draped catafalque containing

a figure of Christ. At midnight a procession starts from the church for a march through the city. The Greek priest and the catafalque lead the procession. Devout Greeks light long candles and follow the procession.

Among the Greek population of Tarpon Springs a wedding is quite an affair. Frequently two ceremonies are celebrated, a civil marriage and a church marriage. These ceremonies may occur several weeks apart; oftentimes a public supper for Greek residents follows the marriage by the priest. Then all hands make merry with old-world folk dances; at all such affairs the Greeks are generous and kind-hearted and they enjoy the change from long weeks at sea, while gathering sponges. The sponge boats always come to port for the holidays at New Year's and Easter; except for unusually rough weather, they may remain at sea for a period of three to six weeks at a time.

Previous to 1905 all the sponges gathered in the Florida coast was by the process of "hooking." By this procedure the operator looks at the sea bottom through a glass bottom bucket, held in one hand; this cuts out the interference of the waves. With the other hand he handles a long pole, with a hook on the end.

Fig. 2.—Clipping sponges.

In 1905 the Greeks of Tarpon Springs began to gather the sponges by use of submarine divers. In former days in the Mediterranena Sea men dived for sponges and descended by means of a rope and a weighted stone; the limit of time of a dive was about three minutes. With a diving suit supplied with compressed air a diver may stay under water for three or four hours. In deeper water the time for working is much shorter, since the air pressure is greater. If the diver goes to great depth—100 feet or so—his blood will dissolve more air. Coming to the surface very quickly results in the disease known as "the bends," due to the escape of air as bubbles in the blood stream; it causes intense pain and may produce a partial paralysis, or even death.

The boats used for sponge-gathering are almost identical with boats used for the same purpose in the Eastern Mediterranean region over 2000 years ago; they are broad and staunch with a high bow, and are driven by internal-combustion engines, but also carry mast and sails for use when necessary. Like any sea-going ship, a sponge boat carries a supply of fresh water, cook's galley, and an abundant supply of food.

Around Key West all sponges are gathered from boats that operate by "hookers;" no divers are used there. At Tarpon Springs the operators of the sponge boats have agreed that no divers shall gather sponges in water that is less than thirty feet deep. Consequently, all hooking for sponges is done in shallow water near shore.

The sponge fleet of the Gulf Coast of Florida consists of about twenty boats for "hookers" and about eighty boats for "divers;" a sponge boat for deep sea work carries a crew of about eight men and from two to six divers.

Sponges usually grow attached to rocks on the sea-bottom—smaller ones are pulled off, larger ones are cut at the base to free them. As the diver gathers sponges he puts them in a rope net; when the latter is full it is pulled to the surface and an empty net is lowered to the diver.

Occasionally, a diver is approached by a shark or a barracuda, but the latter seem to fear the diver who has the metal helmet from which air bubbles escape. Divers say, that if they will stand still the shark will satisfy its curiosity and then go away, but some divers carry large steel knives for better protection.

When sponges arrive on the deck of the boat the gurry and the skin are removed from the sponge by continued squeezing and washing with water. Oftentimes the crew will tread out sponges with their bare feet; soaking over night in water aids in removal of the last portions of the gurry, and this completes the cleaning of the sponges; next the sponges are dried in air and then tightly packed in the space below deck.

In case sponges are not freed from the "gurry" and are allowed to remain in a heap they undergo a process of fermentation and will turn yellow; such sponges are called "sick," because of the undesirable color. They may be restored to their original color by treatment with gurry from a fresh sponge. Gurry has a disagreeable odor; the sponge crew apply it on cuts, bruised hands and feet, because of its curative action.

Previous to 1931 the sponge boats were financed by the captains. Due to the fact that valuable time was often lost waiting for the sale of the catch, the American-Hellenic Sponge Corporation has just been organized, and, henceforth the fleet will go to sea under a contract with this new concern. The captains of the vessels sign a contract for a period of five years for the new company to handle their sponges. The corporation makes a loan to the captain so that he can go to sea without loss of time and when he returns there will be immediate sale of the sponges to the corporation; the money for the sponge harvest will await the crew upon their arrival and the ship can return promptly for more sponges. It is estimated that this new corporation will increase the productivity of the fleet from $800,000 to $1,000,000 a year.

The proceeds of a catch are divided on the share basis. From the selling price is deducted the costs of the operations, interest, insurance, repairs, fuel, etc., and, after the net profit is determined, it is allocated as follows: boat, five shares; diver, three shares; engineer, two shares; life-line tender one and one-half shares; cook, one and one-half shares; and deck hands one and one-half shares each.

Of the thousands of species of sponge there are perhaps only about a dozen of them used by man. The waters of Florida produce only four of commercial value; they are: Sheep's wool, yellow, grass and wire sponges. Sponges are graded according to size which indicates the number required to make a pound; thus there are—two's, three's, four's, etc. The sizes are usually grouped together, *e. g.*, four–six, six–eight and eight–ten.

The sheep's wool sponge is the first in importance. It furnishes the major part of the value of the harvested commercial sponge. Fours to sixes make the No. 1 grade, sixes to eights make the No. 2 grade. The quality of wool sponges improves with the depth of the water. They wholesale at from $4.00 to $6.00 a pound.

Yellow sponges are next in value. Some of these are found in shallow water

but like the wool sponge the grade improves with the depth. The sizes sold are four–six, six–eight and eight–ten. The wholesale value is about $2.00 per pound.

The grass sponge produces a better grade in shallow water. The commercial sizes are four–six, six–eight and eight–ten. The wholesale value is about $1.50 to $1.60 per pound.

Not many wire sponges sold. They have a coarser texture and, therefore, do not hold water as well as other grades. They do not grow in shallow water but come from a greater depth than the grass sponge, near to the yellow sponges. The market sizes are four–six, six–eight and eight–ten. The wholesale value is about $2.00 per pound.

The Sponge Exchange at Tarpon Springs handles nearly all sales of sponges. The Exchange has buildings on the shore of the Anclote River, directly back of the docks where the sponge boats unload; a brick building surrounds a large hollow square; it has no windows or openings in its outer walls. A large cell or room is reserved for each sponge boat. Protection and circulation of air is afforded by a door of steel bars in each cell which opens on the hollow square. When a large number of sponge boats come to port, the Sponge Exchange holds a sale; the sponges are piled in great heaps and rows in the open hollow square, and the buyers for large wholesale interests in all parts of the country inspect them. They judge the quality of the sponges and prepare their bids. At the time of the sale the buyers hand bids, in writing, to the master of the Exchange. He opens the bids and awards the sponges to the highest bidders. So expert are these buyers that frequently their bids differ by only a few dollars on a thousand dollar lot. The Exchange delivers the sponges to the buyer at the latter's sponge house in the city.

At the sponge house the sponges are sorted and trimmed to uniform sizes and suitable shapes; the trimming is done by hand by the use of sheep shears; pieces of coral are removed by pounding the sponges with a wooden club. Sponges are sometimes injured by holes having been eaten into them by crawfish.

For shipment the sponges are compressed into bales, wrapped in burlap and roped. If a bale of sponges gets wet, the swelling of the sponges will cause sufficient pressure to break the ropes.

For some purposes sponges are bleached before sale to retailers. Bleaching is usually done by treating the sponge with hydrochloric acid and a dilute solution of potassium permanganate; the chlorine generated by this mixture is the active bleaching agent. It is commonly held that bleaching has a tendency to weaken sponge fibre. On a small scale sponges have been bleached by use of bromine water.

Sponges are very sensitive to the action of acids and alkalies; in acid solutions a sponge will weaken and gradually disintegrate, especially if the solution is warm. In a warm, strongly alkaline solution one may dissolve a large amount of sponge; ammonia and amino-compounds are evolved in the process, and a small amount of gritty residue will remain undissolved. The alkaline solution will be quite viscous and show a dark color.

Since sponge is nearly fire-proof, it would seem to offer possible uses in electric insulation; it may also be used for gaskets, pads and, perhaps, as absorbent surgical dressings. It is recorded that Roman soldiers used sponge linings in their helmets to lessen the shock of heavy blows from swords during battle. Internal administration of ground sponge has been employed to relieve goiter.

The amount of waste sponge clippings from Tarpon Springs sponge packing houses is not great enough to support wide use of the clippings in a new industry; however, in the waters of the Gulf of Mexico there grow great quantities of a type of sponge (the so-called Loggerhead Sponge) which is not now commercially gathered; it has a coarse structure and very tough fibres; it grows to large size, often several feet in diameter. There seems to be possible extensive use for Loggerhead sponge, after its texture and properties have been more carefully studied; research in this field would seem to offer rich rewards.

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DOES MODERN SOCIETY NEED THE SCIENTIFICALLY TRAINED PHARMACIST?*

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Let us face the question squarely. Is there any real need in modern society for the scientifically trained and liberally educated pharmacist, or is the demand for the four years' course of college training an idle dream of visionary college professors desirous of advancing their own dignity and importance?

It is an accepted axiom of trade that articles which meet a public need will have an assured market. This must be qualified by the statement that the apparent wants of men are frequently at variance with their actual needs; the public may want something very intensely without really needing it, or it may need something very greatly without wanting it, *i. e.*, without realizing its needs.

The progress of civilization has consisted largely in the discovery of useful things by a comparatively small number of thinkers, which the world did not know it needed until after they had been brought into existence. The world did not know it needed, and consequently did not demand telephones, automobiles, radio-sets and a hundred other modern conveniences and luxuries until these inventions had been brought into being and the advantages of their possession were made known.

Publicity is as important as utility in creating demand. The thing or service which meets a public need must be brought to public notice before it will be utilized. Many things of utility have long remained unused until enterprising individuals with a turn for publicity have brought them to the world's attention.

The complete formula for industrial, commercial or professional success is to supply the kind of thing or service which fits a real need of society, and then to adequately acquaint the world of the advantage of possessing it.

If a certain type of drug store represents all that should be expected of pharmacy, a six months' course of training would be ample, but if pharmacy is to render the best quality of service of which it is capable, and the quality which society and the medical profession have the right to demand of it, the four years' college course is not an hour too long.

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* Joint meeting of Virginia and West Virginia Pharmaceutical Associations, June 21, 1932.

Unquestionably society needs the quality of pharmaceutical service which only the broadly trained and professionally minded pharmacist can render.

Already the process of supplying this quality of pharmacopœial service and of creating the demand for it is well under way. In all of the larger cities and in many of the smaller ones, there are establishments representing the best type of pharmaceutical practice, the prosperity of which and the rate at which their number is increasing, affording ample proof that when public and physicians are sufficiently acquainted with the possibility of such service, the demand for it will be found to exist.

The joint constructive task now before the colleges of pharmacy and associations is first to supply the men of adequate professional training, and second to promote the growth of public appreciation of the value of scientific pharmacy.

THE RELATION OF THE PRACTICE OF PHARMACY TO THE DRUG BUSINESS.

That there is both a connection and a distinction between the practice of pharmacy properly so-called, and the "drug business" is generally recognized, but not every one has taken the pains to trace clearly the respective connections and differences.

At least since Roman times a distinction has been recognized between the function of selecting and compounding drugs and medicines and the business of handling them as articles of commerce, and higher qualifications have always been expected of the compounder than of the mere seller of drugs.

This ancient distinction between compounding and selling was recognized by the edict of Salerno, issued by King Frederick of Sicily (A. D. 1244), the influence of which can be traced through all the later European regulations of the obligations and franchises of the art of the apothecary.

In Paris, by an ordinance adopted in 1514, defining the special privileges and responsibilities of the apothecary, it was specifically declared that, "though the apothecary is always a grocer, the grocer is not necessarily an apothecary."

In Great Britain the distinction between the functions of compounding and selling was pointed out by King James I, who in the contest between the Grocers' Company and the Guild of Apothecaries, declared that grocers were but "traders," whereas the art of the apothecary was a "mystery," *i. e.*, a technical calling demanding special training and skill.

Many other quotations might be given showing that from a very early period a distinction between the functions of the apothecary and those of the mere trader in drugs has universally been recognized.

In our day the practice of pharmacy, properly so-called, may fairly be said to comprise all of the operations and processes involved in the selection and identification of drugs and medicines, and of their manipulation or combination, ending in a finished preparation, provided with an appropriate label.

All of the respective steps and manipulations from the first selection and identification of the substances to their final assemblage into finished and correctly labeled packages are of strictly pharmaceutical character, and demand a high degree of training and of acquired skill in their proper performance. They demand a knowledge of scientific terminology, of botany and of pharmacognosy, of materia medica, posology and toxicology, of the laws of chemical combination,

of incompatibilities, of the practice of chemical analysis, and of the various forms of manipulation comprehended under the head of pharmaceutical technique.

Not until the final package has been provided with a label correctly indicating its contents, or giving directions for its proper use, can the work of the pharmacist or apothecary be said to be complete. The delivery of the finished and properly labeled package to a purchaser may be done by an errand boy or other untrained person, but to select the proper drug or medicine from the general stock and to see that the appropriate label is attached requires the technical training and skill of the pharmacist.

The business of the druggist or trader properly begins where that of the pharmacist ends, that is, with the identified and properly labeled drug or chemical, or with the finished and correctly labeled medicine, ready for delivery to the purchaser or user without the need of further skilled manipulation or of further directions for use. In short the drug business may be regarded as the distributive side of pharmacy, requiring commercial ability rather than technical or professional knowledge and skill.

The functions of pharmacist and druggist may be and commonly are performed by the same individual, though establishments may range from those in which pharmaceutical service predominates to those in which only a faint tincture of pharmacy remains. Some time in the future there may be greater differentiation between those who make a specialty of pharmaceutical service and those who prefer to do a general drug business, but the two kinds of service are not likely ever to be completely separated.

In drug stores as we know them there are commonly many articles that do not have any recognizable relation to the supplying of drugs and medicines or sanitary appliances. In many cases this combination is a concession to necessity since the amount of real drug business available would not be sufficient to support an establishment dealing in drugs and medicines only. This yielding to practical necessity is unobjectionable, *provided the dominant note of the establishment is that of a pharmacy or drug store.* The display of jewelry, alarm clocks, canary birds and other non-drug items should never be permitted to obscure the fact that the supplying of drugs and medicines constitutes the main purpose and the real reason for the existence of the establishment.

THEORY AND PHILOSOPHY OF THE PHARMACY ACTS.

A due appreciation of the distinction between the practice of pharmacy and the handling of drugs as merchandise is essential to a proper understanding of the theory and philosophy of the pharmacy acts, or the statutes which restrict the practice of pharmacy to those who have been certified to possess certain specified qualifications of education and experience.

Let it be remembered once for all that the purpose of the pharmacy acts is not to protect the pharmacist against competition, but to protect the public health by limiting the compounding and dispensing of drugs and medicines to properly qualified persons. So far as the theory of the law is concerned the purpose of the act is restrictive and not protective.

Under State and Federal constitutions there is no more warrant for legislation to protect the druggist's business interests than to protect the business interests

of any other class of dealers. Anything appearing upon the face of an act, or clearly deducible from its text, indicating that its primary purpose is to benefit the pharmacist rather than to protect the public health, will compel the courts of last resort to declare the law invalid.

Not only should all proposed legislation affecting pharmacy plainly show its purpose to protect the public interest, but in discussing legislation of this character all such phrases as "price protection," "protection of the pharmacist," etc., should be avoided as helping to give color to the charge that they are inspired by purely selfish motives.

It is true that where a high degree of qualification is demanded of the dispenser of drugs and medicines, and where the requirements are enforced, those who take the pains to acquire these qualifications will be protected against the competition of those who are unqualified, but this is purely incidental to the general public benefit secured by the law, and from a constitutional standpoint is unobjectionable.

From a study of the pharmacy acts which have been upheld by the courts it will be noted that their restrictive provisions have applied to acts that properly require the exercise of technical knowledge and skill, *i. e.*, which are truly pharmaceutical, as the dispensing of potent drugs and active poisons, the compounding of physicians' prescriptions, etc., activities that are a menace to public safety if performed by those who have not had pharmaceutical training.

Of the laws affecting the drug business which have been over-turned by the courts, such as limiting the sale of common domestic remedies or of package medicines to stores conducted by registered pharmacists, etc., the ground given for the decision in every case has been that the measure did not contribute to public safety, but was in fact designed to advance the business interests of the druggist, and therefore unconstitutional and void.

It must be evident, therefore, that the business of dealing in drugs and medicines will be restricted by the law only so far as it is tied up with or involves the practice of pharmacy. It is because of these considerations that the professors of pharmacy, so frequently called theorists and visionaries, have insisted that the practice of pharmacy constitutes the only logical and legal foundation for the drug business, and that the sound and comprehensive education of the pharmacist can supply the only basis upon which a prosperous and permanent practice of pharmacy can be established and maintained.

PROFESSIONAL QUALIFICATIONS ARE PERSONAL AND INDIVIDUAL.

Professional qualifications, such as are attested by a college diploma, or by the certificate of an official examining board, are purely individual and personal, and cannot be transferred from one person to another.

Since a corporate body cannot pursue a college course of instruction nor pass an examination, it follows that corporations cannot properly be licensed to carry on professional occupations.

But while corporations acting as such cannot directly render professional services they can, under proper circumstances, undertake trusts which, as an incident to their execution, require professional services, and for which they may employ professionally qualified practitioners. Thus a trust company, while it may

not profess to carry on the practice of law, may as a corporation accept the care of trust funds or trusts affecting real estate, and employ qualified lawyers to care for the legal proceedings which arise in connection with the execution of such trusts.

In the same way although a corporation may not profess to practice pharmacy or medicine, it may own and conduct a hospital in which the necessary pharmaceutical and medical services are entirely in the hands of, or directly under the supervision of qualified pharmacists and physicians.

By the same course of reasoning it has been held that a corporation may own and operate a drug store in which all of the pharmaceutical services rendered therein are directly under the supervision of legally qualified pharmacists.

A DEFINITE PROGRAM FOR PHARMACY NEEDED.

One of pharmacy's greatest present needs is a generally agreed upon program, starting from basic principles and seeking clearly defined and worth-while objectives.

At present there are almost as many proposed programs for the reform of pharmacy as there are writers upon the subject, and nearly as many proposed objectives, but without much agreement either as to the particular things to be done or as to the best methods of doing them. Some objectives are distinctly worth while, while others are best described as picayunish, since their accomplishment would require efforts out of all proportion to their probable benefit, or are objectives that might even be detrimental if obtained.

Unless based upon sound principles, the program will be neither fruitful nor lasting. If it does not propose definite and worth-while objectives, efforts will be wasted upon minor issues that will confuse the main purposes in view and contribute little or nothing to the final result. And finally, unless there can be a general acceptance of the objectives and a general agreement as to the methods of seeking them, progress will be slow, perhaps impossible.

One principle always to be kept in mind is that the advancement of pharmacy should be sought through methods which have due regard to public interest, rather than through some trick of legislation designed to give the pharmacist a special advantage over possible competitors. This should be an invariable policy, not only because it is just, but because it represents the only policy that will place pharmacy on an unassailable foundation. Even if a legislature could be cajoled into passing an act giving special advantages to the druggist the measure can be expected to hold only until it reaches the courts of last resort.

THE APPRENTICESHIP SYSTEM AND PROFESSIONAL TRADITION.

Two invaluable results of the old apprenticeship system were the craft-consciousness if fostered, and the body of professional traditions it developed and preserved, two essentials without which no occupation has ever been able to achieve any considerable degree of professional solidarity or to gain a high place in public esteem.

The apothecary of the 15th Century who served a period of 14 years before attaining the full rank of Master Apothecary acquired a strong sense of craft-consciousness, was saturated with craft traditions and with high ideals of his professional worth and responsibility. These acquirements he in turn passed on to

his own apprentices, and such ideals and traditions have to a large extent influenced the development of pharmacy in Continental Europe.

In the United States pharmacy was compelled to develop largely without the aid of the professional traditions fostered by an apprenticeship system. The system gained a partial foothold in cities of the Atlantic Seaboard but except in isolated cases never penetrated far inland. There could be no effective apprenticeship system without Masters to receive and teach apprentices. Many of those who did accept apprentices were largely self taught.

Under pioneer conditions the same individual was frequently compelled to carry on quite unrelated activities. He might serve as community land surveyor, lawyer and doctor, or perhaps combine the duties of farmer, blacksmith, merchant and preacher. Drugs and medicines were first introduced into the West as part of the stocks of general merchandise, and separate drug stores were gradually evolved from these, their proprietors sometimes being physicians, but in most instances gaining their knowledge of drugs as they went along.

When drug stores had increased sufficiently in numbers to become a separate feature in community life there came the beginning of a class consciousness which resulted in the practice of pharmacy acts, most of which have been enacted within the past fifty or sixty years. We have a written code of ethics, but without the living traditions necessary to make it an effective force, so that it represents the aspirations of the few rather than the accepted practice of the many.

It is upon our colleges of pharmacy and upon our state and national associations that we must rely for the contacts and influences that will gradually create a body of living professional traditions, including a proper sense of professional obligation, and of professional self-respect.

CHEAP CLERKS THE CAUSE OF TOO MANY DRUG STORES.

Any plan to advance the professional and economic status of the pharmacist must reckon with two basic facts, *first*, that the number of drug stores and so-called pharmacies is far in excess of the number fairly required to render all of the pharmaceutical services needed by the present population, and *second*, that as long as this disproportion between supply and demand continues the evils of excessive competition will persist.

When the acts requiring the examination and registration of pharmacists were first adopted it was confidently believed by many that an effective check had been placed upon the opening of unnecessary drug stores. The theory may have been correct, but its execution has been defective. The qualifications to be required of candidates were largely left to the discretion of the boards of pharmacy, and neither these nor the members of the trade at large were prepared to accept such standards as would have effectively barred the admission of half-trained and incompetent men. Almost every attempt to advance entrance requirements has been met by the objection that it would make clerks scarce and enable them to demand more compensation than their employers would be able to pay, the objectors forgetting that the cheap clerk of to-day will become the cheap and incompetent pharmacist of to-morrow.

If like dentistry and medicine, pharmacy had made a radical increase in the educational requirements of those seeking admission to its ranks, the hopes of those

who advocated the pharmacy acts might have been realized. Instead, the standards were made just high enough to create a general impression that pharmacy was a protected calling, and yet easy to get into as compared to other professions, with the result that the really fit men admitted have always been accompanied by a sufficient number of inferior ones to offset the advantages of the restrictions imposed by law.

An abundance of cheap clerks inevitably leads to a superabundance of cheap proprietors. Finding himself in possession of a certificate authorizing him to operate a store of his own, the average young man is not long content to fill the rôle of clerk at an inadequate wage. He longs for the fancied independence and greater profits which he imagines will be his when he becomes a proprietor and his own boss, and as soon as he can secure the minimum of capital and credit required, embarks in business on his own account. Sometimes he is successful, but too frequently finds himself bound in debt slavery for a long period of years. His fancied greater independence turns out to be a myth. By working excessively long hours, he is able to make a bare living, but finds himself tied to a business which he cannot leave without sacrificing all that he had accumulated.

The desire to secure cheap clerks through low standards of admission has resulted simply in increasing the number of unneeded drug stores, and thereby diminishing the profits from which clerks must be paid.

Much more satisfactory would be a situation which, if it could be brought about, would be to keep the number of establishments in reasonable proportion to population and available business, and thus enable their proprietors to pay assistants an adequate wage.

NO UNIVERSAL OR QUICK REMEDY FOR PHARMACEUTICAL ILLS.

The improved economic and professional conditions in pharmacy which we hope for cannot be reached at a single bound, nor through some extraordinary act of the legislature, nor by virtue of some newly invented legal expedient. The accumulated results of the negligence and mistakes of generations cannot be corrected in a day, nor through the operation of some great panacea.

The utmost we can expect of legislation is that it may furnish the conditions under which it will be possible for the pharmacist to work out his own salvation. Carefully constructed and properly enforced laws can be of very great assistance through the creation of sufficient educational standards, the restriction of the sale of potent drugs and poisons to properly qualified persons, and through amendment of the antiquated trust laws which prevent pharmacists from combining for their reasonable self-protection, but in and of itself legislation is of secondary importance in bringing pharmacy to the position which we believe it should occupy among human occupations.

The attainment of such a position involves the development of a degree of craft-consciousness that will unite the loose units of pharmacy into a cohesive body with a strong sense of community interest. It means the development of living traditions of professional self-respect and of professional obligation, and a realization that pharmacy can best serve itself through rendering the best possible service to society.

If we will definitely commit ourselves to an educational program that will place pharmacy on a parity with other liberally educated professions, and labor intelligently and persistently for that goal, there is reason to believe that society will eventually recognize the value of the professionally trained pharmacist, and that there will also remain a field for the activities of the merchant druggist.

AN INTERNATIONAL CENTER FOR CHEMICAL INFORMATION.

The Maison de la Chimie now under construction in Paris is to be the headquarters of the International Chemical Union which had its inception in the efforts of the late William Ostwald. A purpose is to avoid duplication by making this a central station for information. Organization of the library will be the first undertaking; it is to be very complete and to that end chemists are to contribute copies of their published works; lists of chemical substances with papers describing them, etc. The idea is to supply information and the further aim is to compile a comprehensive encyclopedic chemical dictionary. The abstracting journals represent duplication and are limited in degree. The project will be developed and of general usefulness to chemists and scientists generally. The idea of the American Institute of Pharmacy has in it a more or less related purpose.

HOSPITAL TRAGEDY.

Two ordinary white medicine bottles filled with brown liquid were exhibits at an inquest held at Dartford, Kent (Australia), recently. One contained belladonna and glycerin and one syrup of figs.

The belladonna had been given in mistake for syrup of figs by a young nurse to three patients in Livingstone Hospital, and one of them, Mrs. Beatrice Mary Summers, wife of a postman, had died. The other patients were progressing favorably. A verdict of "accidental death" was returned. No rider was added by the jury.

The widower said that his wife was progressing favorably after an operation. "When I visited her on Thursday night," he said, "she told me she was dying. I was asked to leave the ward, and was told that there had been a mistake. I was sent for about eight o'clock next morning, and my wife died shortly afterward."

Megan Davida James, aged seventeen, a probationer nurse, said she was told by a sister to administer aperients which were on a tray in the medicine cupboard. Medicines, embrocations and drugs were generally kept in the same cupboard, and there were no divisions between them.

Witness said she took what she thought was syrup of figs, but she afterward knew it to be belladonna and glycerin. Both were ordinary white glass bottles, and the labels were stained and almost illegible.

Sister Marion Hebborn said she could not say how or when the belladonna bottle came to be in the cupboard.

When the coroner questioned witness on the condition of the bottles she admitted that this should not be so. The witness fainted at this point, and had to be taken out of the room.

A doctor said he found Mrs. Summers showing signs of poisoning. Everything possible was done for her, but she died the next morning. He agreed that the bottle produced was not a suitable one in which to keep poison.

The matron of the hospital, Janet Shields Anderson, said she had asked the committee to provide another medicine cabinet, but it had not been done.

"There is no doubt that there was want of organization and supervision," said the coroner. He alluded to the youth of Nurse James, and said it was advisable that certificates of birth should be asked for when young nurses were appointed. This nurse should have served a much longer probation before taking on such responsibilities as giving medicine, he added. It was a most serious mistake, but all the blame could not be put on the nurse. The coroner said he hoped that the hospital authorities would also see that proper accommodation was provided for the keeping of drugs. The labels on the bottles were most unsatisfactory.—*The Australasian Journal of Pharmacy.*

THE DEPARTMENT OF THE AMERICAN ASSOCIATION OF COLLEGES OF PHARMACY

C. B. JORDAN—CHAIRMAN OF EXECUTIVE COMMITTEE, A. A. C. P., EDITOR OF THIS DEPARTMENT.

Editorial Note: The following papers by Deans Sturmer and Dandreau were presented at the Conference of Boards and Colleges of District No. 2 and were submitted to me by Dean Hugh C. Muldoon, Secretary of the District. The topics discussed by Deans Sturmer and Dandreau are timely and I trust that they will have the attention of all readers of this Section.—C. B. JORDAN, *Editor*.

SOME THOUGHTS ON COMPREHENSIVE FINAL EXAMINATIONS.

BY DR. J. W. STURMER.*

In the early nineties final examinations came along as regularly as June roses, and were as inescapable as taxes. Soon, thereafter, this annual ordeal fell into bad repute, and many universities and colleges discontinued the practice. The controversy which affected the change was no mild affair: it brought forth much emotional oratory and divided faculties into hostile camps. Professors who claimed to be exponents of the advanced thought in education held that final examinations were the last word in pedagogic asininity; that they were futile as well as unfair, that they created conditions under which good teaching could not flourish, that they perpetrated an injustice on the real student, while they favored the loafer who happened to have the ability to cram for the occasion, that they were a manifestation of cruelty which should be reported to the humane society. Yes, there were deep convictions on the subject in those days.

And now we have a great institution of learning, namely, the University of Chicago, proudly proclaiming its new educational policy which involves affording the undergraduate the utmost freedom in regard to attendance, even to the point of no attendance, but requiring, before the degree may be conferred, satisfactory scholastic achievement as evidenced by comprehensive examinations. And knowing the University of Chicago, and its ideals, I am sure that this new policy does not signify a prospective lowering of scholastic standards. It means, rather, that there are, in its present system of operation, certain features which have turned out badly, have been disappointing as to results and that these flaws are now to be eradicated, even though it may require a major operation. It means also that this institution of learning is confident that there may be devised examinations which are real achievement tests, for unless this were the case, the new policy could not have had the support of experienced educators.

And if the University of Chicago can elaborate tests which may be depended upon to serve as a true measure of achievement, probably we can—at least we can learn how this may be done; and we can conduct such dependable tests, even though we may wish to retain all our present graduation requirements. I would state, however, as my firm conviction, that unless we can make our final examinations true achievement tests, we had better get along without them, for the wrong type is just as objectionable to-day as it was in the late nineties.

* Philadelphia College of Pharmacy and Science.

I have seen the pendulum of pedagogic wisdom swing back and forth several times, and from one extreme attitude toward finals to the other. I have conducted courses with finals, without finals, then with finals, once more without and again with finals; and my judgment is that finals are unnecessary in such subjects as mathematics or language, but are desirable in subjects where there is a lack of integration of knowledge, and in which factual knowledge figures largely. Unfortunately, it is in these latter subjects that special difficulties are encountered in framing questions which would constitute a true test, capable of showing conclusively whether the candidate had an adequate fund of facts and could make intelligent use of them. Thus we are forced to decide what constitutes an adequate fund—and of which facts.

Shall we say 75% is enough? If we so decide, it is with the realization that our decision is of necessity an arbitrary one, and without a demonstrable basis. We can, of course, soothe our conscience by citing as a parallel and a precedent, the age-requirement for full citizenship, a requirement which also is arbitrary and clean-cut, and which ignores the fact that some individuals are more matured as to mentality, and in their judgment at the age of twenty, than others are at thirty, or at sixty. There is, however, this difference: time alone will cure a deficiency in age, and there is no ignominy attached to youth, while failure at college is considered a disgrace, and it means, if not a complete change of life's plans, certainly another year of preparation, with the incident extra expense. It is therefore with the greatest reluctance that faculties express scholastic standards in definite figures representing arbitrary decisions.

Remember, I am not objecting to 75% as the passing-mark, but wish to emphasize our responsibility when we proceed to determine on a strictly mathematical basis—no matter whether the figure be 75%, 70% or any other—who is to graduate and who is to repeat the year. We do not relish the necessity of drawing a hair line as a separation, thus creating by that act two distinct groups, one of which is destined to receive the bad news from the dean's office. Certainly we would feel more comfortable about our verdict if we could contrive tests which decisively and unmistakably placed each candidate in the one group or the other. Probably this may be accomplished by reducing, in our examinations, the emphasis on memory work, or by making a distinction between assimilated knowledge, and knowledge in original packages.

We pass now to another aspect: Let us assume, as an illustration, that a certain course embodies 5000 facts, and that 50 questions constitute the final examination. Our test-portion thus represents 1%, and we must admit that the element of chance enters into the procedure, for we have no means of making this small test-portion as representative of the student's fund of knowledge as a test-portion for chemical analysis may be made representative of a sample to be analyzed. Thus it is evident that some of the candidates who just make the grade are plain lucky, while some who fail might have passed, had Fortune, the fickle goddess, not withheld her smiles. We all dislike the thought of running a lottery. It is illegal. How, then, can we work out true achievement tests, not open to the objections so justly urged against a clear-cut passing grade, a meticulously mathematical process in grading and with the element of chance a conspicuous factor? I submit this as a problem for serious study to the teachers whose courses involve, as does

materia medica, for example, a staggering total of factural knowledge, more or less uncorrelated, and certainly devoid of such thorough integration as we find in the matter comprising the foundational courses in the sciences. Obviously the test should be far more comprehensive than one based on a single percentage unit of the subject matter of the course.

Passing now to the other part of my double-barrelled question, namely to an opinion as to the kind of facts worthy of consideration in connection with a final examination, I would answer briefly, *important facts*. Nothing is more fallacious than the assumption that if the candidate shows knowledge of uncommon, out-of-the-way facts, he may reasonably be credited with knowledge of the important facts. That if, for example, he knows about beth root, we may assume that he has full knowledge of cinchona, and of opium, and of nux vomica and of belladonna. If consciously, or subconscious, we are influenced by this assumption we may, in framing our examinations, perpetrate blunders which are indefensible in their unfairness. Moreover, such questions will result in repercussions in the class which will make effective teaching difficult.

Allow me to present a quotation which I consider relevant. A university president, in a recent inaugural address, said:

> "The teacher in a professional school is in a strategic position to preserve and carry forward the liberal culture and the general view. He can bring to a focus on the most highly technical problem all the historical, economic, social, psychological, political or philosophic influences which converge upon it with implicating power."

Here we find an expression on education at its best: a teaching rich in inspirational qualities and in cultural value, helping students to grow and to develop intellectually, helping them to a worth-while objective, and to an understanding of this complex present-day civilization of ours, in order that they may learn how to adjust themselves to it, and to labor valiantly and effectively in their chosen calling. This is the kind of teaching we all aspire to provide for our own students. It expresses the great ambition of every real teacher; and it is because we harbor this ambition that we are antagonistic to anything which might tend to frustrate our efforts in the direction of resultful teaching. And the wrong type of final examination does just that. How can we expect the student to meet us half-way, with a receptive mental attitude—with a favorable "mind-act," and a hearty response to our own enthusiasm, if he has been lead to anticipate, as a climax to the course, an examination covering a list of several thousand uncorrelated facts, many of which he will never use in his practice of the profession, and any of which he could look up in a book, should occasion arise? The reaction, on the part of the student, to a test of this type, is deplorably unfavorable. He feels that such examinations are not in harmony with the instruction, because over-emphasis is placed on memory work, and that the questions do not give him an adequate chance to show what he has learned in the course. The whole thing seems arbitrary and unfair to him, for he does not see how such a test can provide a true measure of his capabilities. The result is that he develops a dislike for the subject, and a resentment toward the teacher who expects attention in lectures which are so largely on matter not comprised in the examination.

So it appears that we cannot have, in courses of the aforementioned type, a high order of teaching, certainly not as far as results are concerned, unless we have

the right type of examinations. I wonder how the University of Chicago, in connection with their new educational policy, would deal with such a subject as materia medica. It certainly presents difficulties, and, not being a teacher in this field, I am wholly incompetent to offer specific suggestions. It is my hope, however, that with the coöperation of our board of pharmacy friends, whose examination problems are inextricably intertwined with ours, there may be devised a real achievement test, comprehensive as to extent, and comprehensible as to its significance, for those subjects which, like materia medica, are burdened with a plethora of uncorrelated facts of varying degrees of importance. Briefly, let us so contrive that our examinations help true education and do not make such education impossible.

WHAT STEPS SHOULD BE TAKEN BY PHARMACY COLLEGE FACULTIES TO KEEP ABREAST OF CHANGES IN THE PRACTICE OF PHARMACY?

BY DEAN JOHN L. DANDREAU.*

I find that for a number of years past considerable thought has been given in the subject which we are to discuss this afternoon, and that many excellent ideas have been put forth which should tend to aid the faculty members in keeping abreast of the times. However, there is still need for some concrete method by which the faculty members may be encouraged to a further endeavor in seeking knowledge pertaining to changes which are taking place from time to time in our profession. That there are changes it is apparent, for there are changes continually taking place in every walk of life.

In a lecture at Yale University, Professor Millikan spoke of the changes which have come since his student days, in supposedly fixed, fundamental and unchangeable principles of matter. He stated that he had listened to a lecture in the early nineties delivered by one of the most famous of world's scientists, in which the speaker stated that probably all the great discoveries in physics had already been made, and that future progress was to be looked for not in bringing to light qualitative new phenomena, but rather in the more exact quantitative measurements upon old phenomena. Then came in 1895 and later, the Roentgen-ray and radio activity. Thus proving the 19th century to be the beginning and not the end of discoveries; that there were new properties of matter and that this was a dynamic instead of a static universe. "The dogma of immutable elements," said Professor Millikan, "is forever gone; the physical world is changing, evolving and it is a dynamic living organism. The keynote of modern science is service, the subordination of the individual to the good of the whole." It seems that perhaps we are a little bit too near our own profession to realize that these same processes have been going on in Pharmacy and that the same key note may be appropriately sounded by pharmaceutical educators.

The ever-changing conditions in the practice of pharmacy, and the rapidly changing curriculum in the colleges are factors with which we should reckon. It was in 1927 when the two-year course was changed to a three-year college course. Now we are putting into practice a much needed four-year course for pharmacy.

* St. John's College, School of Pharmacy.

Also we find that in the general practice of pharmacy we have two schools of thought; one in which emphasis is put forth from a strictly professional standpoint, another which considers the commercial aspect as well as the professional side. We find, too, state pharmaceutical legislation changing with modern conditions. It is the work of the teacher to know these changes as well as the subject matter of his individual course, and to keep abreast of general educational conditions.

It is for the teacher to inculcate in the minds of the student-body the ideals of his chosen profession, and to intensify and increase the cultural, spiritual and scientific phases of pharmaceutical education. It is important that our students should be fortified with such principles so that in later life our young men and women who matriculate in our colleges of pharmacy may be properly trained to counteract the appeal to lower levels of thought, feeling and conduct, so alluringly presented by this ultra-realistic and mechanical world. Surely our faculty members have a great trust imposed upon them. It should be the aim of all teachers in pharmacy to aid the student to work in the light of high ideals, to cherish lofty aims and purposes and to devote their lives to truth and justice and to foster a spirit which will keep high the profession of pharmacy. These things can only be accomplished and the teacher can only be qualified, if he keeps abreast of the changes taking place in modern educational thought and practices.

The question then arises, if the faculty member has these guiding posts in mind, how should he so equip himself to keep abreast of such changes? Methods have already been devised by our pharmaceutical educators as well as by the members of the state boards of pharmacy to so aid the faculty member in acquainting himself with this knowledge, so that it may be passed on to the student body.

We have in the State of New York and no doubt in other states, too, annual conferences of the deans of the various colleges. These conferences are and should be the means of discussing topics which pertain to changes as they occur. Such information should be brought back to the faculty members of the colleges and further discussed by them.

Then, too, there are held annual conferences relating to various departments of the colleges. For instance, last year at the State convention the department of materia medica convened. The year before last, the department of chemistry was in session. It perhaps might be well to consider such conferences in the form of seminars, at which a definite program could be arranged and the presentation of several phases of the work done in each of the departments given. Such papers could then be discussed by all the members of the college, in attendance, and not held to any one particular department. Instead of considering one subject every three years, it could possibly be arranged so that each department might be given an opportunity each year to present such changes as have taken place during that period. Perhaps a full day could be arranged. Of course the success of such a session depends upon a constructive program of current educational topics. Attendance at these seminars, perhaps, could be made compulsory, at least there should be a representative of each department from each college present. There is no doubt with the enlargement of the present annual conferences, the faculty members could obtain considerable knowledge of the changes occurring. At least this is worthy of discussion.

Another idea, which no doubt has been followed for some time, but which

might, perhaps, be intensified is interdepartmental conferences at the individual college. Such conferences are held for the purpose of discovering any weakness in a particular department, and for the securing of coöperation between all departments. These conferences, perhaps, are for the sole purpose of strengthening the institution as a whole, and not so much to help the faculty members to keep abreast of changes occurring outside of college. Now, perhaps a portion of such conferences could be given to the presentation of a paper relating to a particular phase of pharmaceutical education which could be followed by a general discussion by the other members of the faculty, to the end that all might profit by the interchange of ideas. There is no question that this project is carried out at the present time by many colleges, but are topics of purely an educational nature being stressed with the view of enlightening the faculty members of changes taking place in pharmacy?

Again, perhaps a "Back to College" movement could be inaugurated for faculty members. This, too, is not an entirely new thought in education. However, we might enlarge upon the thought and encourage faculty members to attend university seminars, relating to the practice of pharmacy either during the college year or during the vacation. Such subjects as "The History of Pharmacy," "A Comparative Study of Ancient and Modern Pharmacy," or "The Twentieth Century History of Pharmacy" might be fit topics for such seminars. There might be such subjects which touch upon the "Philosophy of Pharmacy," "Methods in Teaching Pharmacy," etc. Such seminars might be offered by centrally located colleges, and presented by leading pharmaceutical educators. The practicability of offering such courses might be worthy of discussion. The organization, duration and methods of creating interest among faculty members for such courses might be discussed.

Such a "Back to College" movement might be materialized into a Pharmacy Institute such as we have in other branches of education. The members of the faculty might be urged to pursue such courses for further advancement on their respective faculties. Such courses offered and presented by the leaders in pharmacy who are themselves specialists, in their own subjects could greatly aid in helping a faculty member to keep abreast of the times.

Although we have, and are very proud to possess several journals of repute, the suggestion of publishing a periodical to be known as "The Journal of Pharmaceutical Education," similar to that published by the American Chemical Society, might well be discussed. The very excellent JOURNAL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION without a doubt is read and studied with considerable profit by the members of the faculties. However, isn't there a need for a publication which would deal primarily with education alone, such as the medical and law professions enjoy? Pharmacy has made great strides in the past ten years in the matter of education. Perhaps, if sufficient support could be mustered such a journal could be created which would do much to educate the teacher, in modern methods in the teaching of his subjects and would also acquaint him with the changes in practical Pharmacy.

If, on the other hand, it is the consensus of opinion that the work of the JOURNAL OF THE A. PH. A. would be greatly duplicated, would it not be a topic of discussion that each faculty member interest himself in the Section on Education and Legislation of the A. PH. A., and by the same token might it not be discussed that the activities of the Section on Education be "stepped" up and perhaps be di-

vorced from that of Legislation? But let's not stop there. In the interdepartmental conferences of the college faculty which might be held monthly perhaps a discussion of the current monthly issue of the JOURNAL would help much. Throughout our profession there seems to be an intense interest manifested by the members as regards educational matters in general; we have annual sessions of the parent organization, meetings of the Association of Colleges of Pharmacy, State Board meetings, college conferences of faculties. In fact the projects which I have brought up for discussion are not new to us, with the exception, perhaps, of the "Back to College" movement for faculty members. And in all of these, interest is shown by members in the presentation of papers and general discussion. But, I wonder underneath it all, do we really put into practice the many excellent movements discussed? There is no doubt that every one here is endeavoring to obtain the very best thought on the problems with which we are confronted. Since one of our most important tasks is to find the best teaching methods, are we as teachers doing all we can to keep abreast of our work? Do our teaching hours cease at the end of the lecture period? Are we satisfied with the notes we used last year? Are methods which were in vogue five, ten and twenty years ago sufficiently good enough for us to-day? Are we availing ourselves of the full advantages of the published results of the research, published as to the value of placement and orientation tests?

Conferences such as we now are holding, are excellent in promulgating ideas, but we should not be satisfied with that alone. We should endeavor to put into practice such ideas that seem feasible. There should be open discussion of a cooperative nature and while there has been offered no new phases which might aid the faculty member to keep abreast of the changes taking place, I resubmit to you once more for discussion the following:

1. Semi-annual conferences of deans.
2. Annual faculty seminars.
3. Monthly interdepartmental seminars of college faculties.
4. "Back to College" movement for faculty advancement.

OLD PHARMACY JARS.

On June 8th a collection of apothecary's ewers and alburellos was sold at Southeby's sale rooms in London. This was Glogowski's collection from Berlin. Mr. Geoffrey Howard, an authority on the subject, commenting, in the *Pharmaceutical Journal*, on the collection, said: "I doubt if such an extraordinary collection of fifteenth-century pots has been offered for sale within a lifetime. The remarkable thing about these is that, whereas until the sixteenth century figures and inscriptions are hardly ever found, here we have a number of beautiful examples of fifteenth-century drug jars adorned with heads and the names of drugs. Even so, the fifteenth-century jars are distinctly crude in design compared with those of the following century. One extraordinary thing is that quite suddenly in the first decade of the sixteenth-century enormous strides were made. For example, those listed in the catalogues Nos. 4 and 5 and 19 and 20, ascribed to *circa* 1505, or the beginning of the sixteenth century, are as exquisitely decorated and finished as any pieces of Majolica in existence, while these produced, apparently, only a few years before are, in design, glaze and general effect, comparatively crude efforts on the part of the artist or the potter.

"It would seem that Siena set the pace. This collection shows that it was there that the earliest examples of really brilliant ceramic art are to be found applied to drug jars, though the other great Italian pottery wares, notably Deruta and Gubbio, followed hard in its heels."

ASSOCIATION BUSINESS

AD INTERIM BUSINESS OF THE COUNCIL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION, 1931–1932.

Office of the Secretary, 10 West Chase Street, Baltimore, Md.

LETTER NO. 14.

August 3, 1932.

To the Members of the Council:

98. American Council on Pharmaceutical Education. The motion was by oversight omitted from the vote card sent out with Council Letter No. 13. (See Council Letter No. 12, pages 603 and 604, and Council Letter No. 13, page 722.)

99. Use of the Text of the N. F. V. Motion No. 36 (see Council Letter No. 12, page 604, and Council Letter No. 13, page 722) has been carried.

100. Election of Members. Motions Nos. 37 and 38 (see Council Letter No. 13, page 722) have been carried and applicant numbered L. M. 1 and applicants numbered 296 to 315, inclusive, are declared elected.

101. Use of Text of N. F. V. Sister Alma, St. Thomas Hospital, Akron, Ohio, pharmacist and a member of the A. PH. A., has applied for permission to use the text for partial reproduction in a textbook on materia media for the use of student nurses. Chairman DuMez of the Committee on Publications has approved the request.

(*Motion No. 39*) *It is moved by DuMez that Sister Alma be given permission to use the text of the N. F. V for partial reproduction in the preparation of a textbook on materia media for the use of student nurses, and at the usual charge of $5.00.*

102. Headquarters Building. In the July issue of the JOURNAL OF THE A. PH. A. is an account of the Ground Breaking Ceremony held at the building site on July 1, 1932. An account of the ceremony with photograph of those present has been sent to the pharmaceutical publications through the coöperation of Dr. E. L. Newcomb.

The plan for the landscape treatment of the site, as prepared by Architect Pope, has been approved by the Commissions referred to in Council Letter No. 13, pages 721 and 722.

The Commissioners of the District of Columbia have closed upper Water Street, in accordance with Public Resolution No. 18, and the transfer of property between the Government and the ASSOCIATION is now being completed.

It is expected that building operations will be begun within a few days.

103. Window Strips for Pharmacy Week. During the Miami meeting the Council approved the addition to the Budget of an appropriation of $250 for window strips, to match an equal appropriation by the N. A. R. D. The window strips were arranged for by Dr. Newcomb and were sent out with the Educational Maps supplied by the N. W. D. A.

Dr. Newcomb advises that a medicinal plant map printed in colors will be supplied by the N. W. D. A. for the coming observance of Pharmacy Week and requests that the A. PH. A. again appropriate $250 for window strips, an equal amount being appropriated by the N. A. R. D.

The appropriation has the approval of the Committee on Finance.

(*Motion No. 40*) *It is moved by Bradley that an appropriation of $250 be added to the Budget for 1932 for the purchase of Pharmacy Week Window Strips.*

104. Applicants for Membership. The following applications properly endorsed and accompanied by the first year's dues have been received:

No. 316, Arpy Arsenian, 28 Wolcott St., Everett, Mass.; No. 317, Henry C. Colson, Jr., 20 Mt. Pleasant Ave., Newark, N. J.; No. 318, James M. Damiano, 133 Meserole St., Brooklyn, N. Y.; No. 319, Thomas Lee Honnald, Ennis, Montana; No. 320, Y. D. Hsu, Golden Sea Research Inst. of Chem. Industry, Tangku, N. China; No. 321, J. Leon Kahn, 1301 W. North Ave., Baltimore, Md.; No. 322, H. B. McCullough, Manager, Caldwell Drug Co., Main & Converse Sts., Spartansburg, S. C.; No. 323, C. Benjamin Morgan, 427 No. Main St., Norwich, Conn.; No. 324, Karen Andersen Norgaard, 317 N. Johnson St., Iowa City, Ia.; No. 325, W. Henry Rivard, 10 Beaufort St., Providence, R. I.; No. 326, Sister Mary Alma, St. Thomas Hospital, Akron, Ohio; No. 327, W. T. Sumerford, U. of Ga., Athens, Ga.

(*Motion No. 41*) *Vote on applications for membership in the American Pharmaceutical Association.*

E. F. KELLY, *Secretary.*

EDITORIAL NOTES

Editor: E. G. Eberle, 10 West Chase Street, Baltimore, Md.

Members of the Council, A. PH. A.: S. L. HILTON, *Chairman;* CHARLES H. LAWALL, *Vice-Chairman;* E. F. KELLY, *Secretary;* H. V. ARNY, A. G. DUMEZ, H. A. B. DUNNING, WILLIAM B. DAY, C. E. CASPARI, J. H. BEAL, W. BRUCE PHILIP, T. J. BRADLEY, AMBROSE HUNSBERGER. *Ex-Officio Members:* WALTER D. ADAMS, *President;* J. G. BEARD, J. W. DARGAVEL, *Vice-Presidents;* C. W. HOLTON, *Treasurer;* E. G. EBERLE, *Editor of the Journal;* A. G. DUMEZ, *Editor of the Year Book;* THOMAS ROACH, *Chairman of the House of Delegates.*

Collaborators: The Members of the Council; E. FULLERTON COOK, *Chairman,* U. S. P. Revision Committee; E. N. GATHERCOAL, *Chairman,* N. F. Revision Committee; Chairmen of the Sections, A. PH. A.: L. E. WARREN, C. J. CLAYTON, W. G. CROCKETT, ROWLAND JONES, J. T. LLOYD, TOWNES R. LEIGH, *President,* A. A. C. P.; CHARLES B. JORDAN, *Chairman,* Executive Committee, A. A. C. P.; A. L. I. WINNE, *President,* N. A. B. P.; HENRY C. CHRISTENSEN, *Secretary,* N. A. B. P. Scientific Section—Board of Review on Papers: *Chairman,* GLENN L. JENKINS, Baltimore, Md.; EDWARD E. SWANSON, Indianapolis, Ind.; W. J. HUSA, Gainesville, Fla.

LET US ASSIST YOU IN SOLVING PRESCRIPTION PROBLEMS.

Dr. S. L. Hilton, former President of the A. PH. A. and Chairman of its Council, well and favorably known pharmacist of Washington, will answer problems that come up in prescription practice. We, therefore, invite those who have problems to send them to this office at 10 W. Chase St.

PARIS SCHOOL OF PHARMACY.

"The new School of Pharmacy at Paris, which is now sufficiently completed to receive the students in pharmacy of that city, is a monument of honor of which our profession can boast, and it is worthy of the fame which pharmacy acquired in the French Capital several centuries ago, and has ever since maintained. Everyone knows that pharmacy in France is a faculty of the University. There are at present nearly 500 students in daily attendance."—*Correspondent.*

SCOTTISH PRESCRIPTIONS.

The following is taken from the *Chemist and Druggist,* reported by the Central Checking Bureau of the Drug Accounts Committee for Scotland, which deals with the pricing of National Health Insurance prescriptions, with the following summary of results of an examination of 36,700 National Health Insurance prescriptions issued in 1916 and taken at random from sixteen areas in Scotland, showing the number of times the thirty most frequently ordered drugs were prescribed:

	Drug or Preparation.	Number of Times Ordered.
(1)	Sod. Bicarb.	3,406
(2)	Tinct. Nucis Vom.	3,354
(3)	Ammon. Carb.	2,727
(4)	Vin. Ipecac	2,679
(5)	Spt. Chloroformi	2,410
(6)	Glycerin	1,967
(7)	Infus. Gent. Co	1,957
(8)	Aqua Chloroformi	1,883
(9)	Sod. Salicyl.	1,842
(10)	Tinct. Camph. Co.	1,835
(11)	Pot. Iodid.	1,498
(12)	Infus. Senegæ	1,416
(13)	Spt. Ammon. Aromat	1,234
(14)	Magnes. Sulph.	1,209
(15)	Liq. Arsenicalis	1,085
(16)	Liq. Strychnin.	1,068
(17)	Syrup Tolu.	1,059
(18)	Bismuth. Carb.	966
(19)	Aqua Menth. Pip.	937
(20)	Liq. Ammon. Acet.	890
(21)	Liq. Morph. Hyd.	774
(22)	Spt. Aether. Nit.	716
(23)	Syrup Aurant.	658
(24)	Quin. Sulph.	646
(25)	Tinct. Digitalis	619
(26)	Acetanilid	614
(27)	Syrup Hyp. Co.	586
(28)	Infus. Calumbæ	585
(29)	Acid. Acetylsal	540
(30)	Syrup Scillae	538

ADDITIONS TO BRITISH PHARMACOPŒIA 1932.

One hundred and twenty-eight articles and preparations have been added to the British Pharmacopœia of 1932, as follows:

Acidum Hypophosphorosum Dilutem. Acidum Trichloraceticum. Acriflavina. Æthylenum. Agar. Alcohol. Amidopyrina. Ammonii Bicarbonas. Amylocainæ Hydrochloridum. Antimonii et Sodii Tartras Antitoxinum Diphthericum. Antitoxinum Tetanicum. Antitoxinum Welchicum. Aqua Anethi Concentrata. Aqua Cinnamoni Concentrata. Aqua Menthæ Piperitæ Concentrata. Aqua Sterilisata.

Barbitonum Solubile. Barii Sulphas. Belladonna Pulverata. Benzocaina. Bismuthum Præcipitatum.

Caffeina et Sodii Benzoas. Carbonei Dioxidum. Carbonei Tetrachloridum. Carbromalum. Cataplasma Kaolini. Chloramina. Chlorbutol. Cinchophenum. Dextrosum. Digitalis Pulverata.

Elixir Cascaræ Sagradæ. Emetinæ Hydrochloridum. Emetinæ et Bismuthi Iodidum. Ephedrinæ Hydrochloridum. Ergota Præparata. Ergotoxinæ Æthanesulphonas. Erythritylis Tetranitras Dilutus. Eucalpytol. Extractum Cinchonæ. Extractum Colchici Liquidum. Extractum Colchici Siccum. Extractum Hepatis Liquidum. Extractum Hepatis Siccum. Extractum Hyoscyami Liquidum. Extractum Malti. Extractum Malti cum Oleo Morrhuæ. Extractum Pituitarii Liquidum. Extractum Senegæ Liquidum. Extractum Sennæ Liquidum.

Fluoresceinum Solubile.

Gelatinum Zinci.

Hydrargyri Oxycyanidum.

Ichthammol. Indicarminum. Infusum Aurantii Concentratum. Infusum Buchu Concentratum. Infusum Calumbæ Concentratum. Infusum Caryophylli Concentratum. Infusum Gentianæ Compositum Concentratum. Infusum Quassiæ Concentratum. Infusum Senegæ Concentratum. Infusum Sennæ Concentratum. Injectio Bismuthi. Injectio Bismuthi Salicylatis. Injectio Ferri. Injectio Hydrargyri. Injectio Hydrargyri Subchloridi. Injectio Sodii Chloridi et Acaciæ Insulinum. Iodophthaleinum. Ipecacuanha Pulverata.

Jalapa Pulverata.

Lævulosum. Liquor Ammonii Acetatis Fortis. Liquor Ergosterolis Irradiati. Liquor Iodi Simplex. Liquor Sodæ Chlorinatæ Chirurgicalis. Liquor Sodii Chloridii Physiologicus.

Methylthioninæ Chloridum. Mistura Magnesii Hydroxidi.

Neoarsphenamina. Nitrogenii Monoxidum. Nux Vomica Pulverata.

Oculenta. Oleum Chenopodii. Oleum Gossypii Seminis. Oleum Hydnocarpi. Oleum Hydnocarpi Æthylicum. Oleum Santali Australiensis. Opium Pulveratum. Orthocaina. Oxygenium.

Pancreatinum. Pasta Zinci Oxidi Composita. Phenobarbitonum. Phenobarbitonum Solubile. Physostigminæ Salicylas. Procainæ Hydrochloridum.

Quinidinæ Sulphas. Quininæ Bisulphas. Quininæ et Æthylis Carbonas. Quininæ Tannas.

Saccharinum Solubile. Serum Antidysentericum (Shiga). Sodii Citras. Sodii Hydroxidum. Spiritus Methylatus Industrialis. Strophanthinum. Sulpharsphenamina. Syrupus Ferri Phosphatis Compositus.

Theophyllina et Soddi Acetas. Thyroxinsodium. Tinctura Ipecacuanhæ. Tinctura Zingiberis Fortis. Totaquina. Toxinum Diphthericum Calefactum. Toxinum Diphthericum Detoxicatum. Toxinum Diphthericum Diagnosticum. Tuberculinum Pristinum.

Unguentum Acidi Tannici. Unguentum Aquosum. Unguentum Simplex. Urea.

Vaccinum Typho-paratyphosum (T. A. B.). Vaccinum Vaccinæ.

Zinci Stearas.

OMISSIONS FROM BRITISH PHARMACOPŒIA 1914.

The list of deletions from British Pharmacopœia 1914 includes 357 items; in the following only a few of these items are given.

Acetanilidum. Acetum Urgineæ. Acidum Hydriodicum Dilutum. Acidum Nitricum Dilutum. Acidum Sulphuricum Aromaticum. Acidum Sulphurosum. Aconitina. Alumen Exsiccatum. Ammonii Benzoas. Ammonii Bromidum, Amygdala Dulcis. Anisi Fructus. Antimonii Oxidum. Aqua Anisi. Aqua Aurantii Floris. Aqua Fœniculi. Aqua Menthæ Viridis. Aqua Rosæ.

Benzenum. Bismuthi Subnitras.

Caffeinæ Citras. Calx. Cannabis Indica. Carbo Ligni. Carbon Disulphidum. Cetaceum. Chloral Formamidum. Collodium. Collodium Vesicans. Cubebæ Fructus.

EXTRACTUM CANNABIS INDICE. EXTRACTUM COLCHICI. EXTRACTUM RHEI.

GOSSYPIUM. GUAIACOL CARBONAS.

HYDRARGYRI OXIDUM RUBRUM.

JALAPÆ RESINA.

KINO.

LINIMENTUM AMMONIÆ. LINIMENTUM CALCIS. LINIMENTUM CHLOROFORMI. LIQUOR ARSENICI HYDROCHLORICUS. LIQUOR SODÆ CHLORINATÆ. LITHII CITRAS.

OLEUM CHAULMOOGRÆ. OLEUM MENTHÆ VIRIDIS.

SALOL. SPIRITUS CINNAMOMI. SPIRITUS JUNIPERI. SPIRITUS LAVANDULÆ.

TINCTURA LAVANDULÆ COMPOSITA.

UNGUENTUM AQUÆ ROSÆ. UNGUENTUM GALLÆ UNGUENTUM HYDRARGYRI OXIDI FLAVI. UNGUENTUM HYDRARGYRI OXIDI RUBRI. UNGUENTUM IODI.

UVÆ URSI FOLIA.

ZINCI CARBONAS. ZINCI VALERIANAS.

FIFTH EDITION JAPANESE PHARMACOPŒIA.

The fifth edition of the Japanese Pharmacopœia has just been issued. There have been forty-six additions and eighty-five deletions and quite a number of minor changes.

According to the *Weekly Druggist* of Japan the new addition was revised under direction of Departmental Ordinance No. 21 and the revision will become authoritative October first. Preparations manufactured prior to October first will be considered conformative to the new edition, provided they are based on Pharmacopœia No. IV, or pharmacopœias of other countries, or the Departmental Ordinance No. 18, and further providing that they are not injurious.

The following are the official titles of the additions:

Æthylium Aminobenzoinum, Alcaloidum Opii Hydrochlorieum, Amylum Oryzæ, Amylum Tritici, Aqua Phenolata cum Acido Hydrochlorico, Arsenobenzolum, Arsenobenzol-Natrium, Barbitalum Solubile, Barium Sulfuricum, Bromdiæthylacetylurea, Bromvalerylurea, Calcium Glycerino-Phosphoricum, Carbo Medicinalis, Carboneum Tetrachloratum, Caseinum, Chloraminum, Cuprum Citricum, Cotarninium Chloratum, Dextrinum, Ephedrinum Hydrochloricum, Extractum Fæcis, Fæx Medicinalis, Fructus Catalpæ, Glandula Thyreoides Siccata, Hydrargyrum Oxycyanatum, Liquor Calcii Chlorati, Liquor Epirenamini Hydrochlorici, Liquor Kali Glycerinatus, Liquor Lockei, Lobelinum Hydrochloricum, Natrium Nitrosum, Neo-Arsenobenzolum, Neo-Arsenobenzolum Fortius, Oleum Citronellæ, Oxygenium Compressum, Phenobarbitalum, Phenobarbitalum Solubile, Rhizoma Pineliæ, Rubrum Scarlatinum Purum, Semen Sinapis Exoleatum, Tabulettæ Aminopyrini, Tabulettæ Hydrargyri Oxycyanati, Unguentum Ammonii Sulfoichthyoliei.

PROGRESS IS BEING MADE IN PREPARATORY WORK FOR THE PHARMACY BUILDING.

The opening remarks of Chairman H. A. B. Dunning, at the breaking of ground, speak for the aims and purposes of the Pharmacy Building, summarized by Dr. E. L. Newcomb in the following:

"We have gathered here today to celebrate a great event in the pharmaceutical world.

"We are breaking ground for the American Institute of Pharmacy, the first of its kind.

"Like all really great enterprises, its nature is altruistic, its purpose to serve mankind.

"It has no commercial or selfish aspects. It is intended to foster the ethics, science and professionalism of pharmacy.

"It will be thoroughly well equipped to accomplish this end.

"It will have a reference library, which will be open to kindred professions and to the public.

"It will have a museum that will be interesting and helpful to all seeking scientific information in any way related to medicine and pharmacy.

"It will have research laboratories which will investigate, evaluate and standardize drugs and medicines prepared by pharmacists and prescribed by the medical profession.

"It will have an educational department, which, through its long established and highly respected JOURNAL, will give its best efforts to guide the destinies of pharmacy, through educational processes, into the proper channels.

"It will have meeting rooms, where the leaders in professional pharmacy, in matters concerning the ethical and professional interest of pharmacy, may gather together and exchange ideas for the improvement and development of the calling which they represent.

"This institution has the interest, good will and support of all phases of pharmaceutical interests. It has great influence in the world of pharmacy and can and will give the service expected of it.

"It has a great future and this is a happy day."

PERSONAL AND NEWS ITEMS.

Hon. T. G. Murphy, Minister of the Interior and Superintendent General of Indian Affairs, is the first druggist in Canada to hold a position in the Dominion Cabinet.

H. M. Burlage, University of North Carolina, has contributed an interesting historical article on the development of modern drugs to the *Carolina Journal of Pharmacy.*

Dr. Ellery H. Harvey, Chicago, recently received his degree in law from The John Marshall Law School. The work he has undertaken is to more adequately handle the problems involved in controlling the quality and labeling.

The University of Heidelberg has conferred an honorary doctorate on Dr. Henry Drysdale Dakin, research chemist, Scarborough-on-Hudson, New York.

A bust of Dr. Frederick G. Banting, Toronto, co-discoverer of insulin, was unveiled at a summer camp for diabetic children near Cleveland on July 31st. Dr. Banting was present at the ceremony, which was sponsored by Dr. Henry J. John and the directors of the camp.

Dr. Charles W. Edmunds, professor of materia medica and therapeutics in the University of Michigan, has been elected vice-chairman of the medical section of the National Research Council and a member of the executive committee.

The sixty-first annual meeting of the American Public Health Association will be held in Washington, D. C., from October 24th–27th, with headquarters at the Willard Hotel.

David Costelo, New York, is the *Honorary President* of the Alumni Association of the Philadelphia College of Pharmacy and Science this year. He is a graduate of the class of 1879. He conducts a strictly professional pharmacy and is an enthusiastic collector of old books and ancient shelf ware and mortars, and has been generous in sharing these with his *Alma Mater.*

Vladimir Bartulic, of Zagreb, reference to whose pharmacy was made in the May JOURNAL, page 526, met with a serious accident in a fire which destroyed his home. He intended to be present at the Toronto meeting and his injury, financial loss and necessitated absence are regretted. He is a member of the A. PH. A.; the hope is expressed for his complete recovery.

Chairman Anton Hogstad, Jr., of Pharmacy Week, has favored the JOURNAL with several photographs of the Wisconsin Association Exhibit, one of which—the library—is shown in this issue (see also June JOURNAL, page 589). There were a number of professional displays around the walls.

1. Famous Discoveries by Famous Pharmacists.

2. National Pharmacy Week Display, which featured the beautiful silver loving cup donated by the Federal Wholesale Druggists' Association and a set of U. S. P. and N. F. preparations in glass-stoppered shelf bottles, as furnished by the University of Wisconsin School of Pharmacy. Mr. Herman L. Emmerich, retiring president of the Association, was largely responsible for this display, as he takes an active interest in U. S. P. and N. F. propaganda.

3. Scenes from Death Valley, prepared by Mr. H. J. Ireland. The twenty-mule team as shown in the photograph was a hand-carved affair by a resident of Milwaukee. Mr. Ireland had arranged to have on hand original alkali sand shipped in from Death Valley for the occasion, together with a varied assortment of assorted chemicals from the collection of the Chemistry Department of the University of Wisconsin.

4. The Story of Digitalis, prepared by Professor Ralph W. Clark, which features flowering specimens of Digitalis, together with crude drug material, percolation, etc.

5. The Conquest of Malaria, which was quite similar to the Cinchona Exhibit features by Merck & Co., Inc., at the tercentenary celebration.

This interesting exhibit attracted continuous attention and proved eminently successful in every way.

Dr. William C. Anderson has been named a member of the New York State Board of Pharmacy for a period of three years; Dr. Anderson is chairman of the Board of Health Committee of the New York Pharmaceutical Conference and a former chairman of the House of Delegates of the AMERICAN PHARMACEUTICAL ASSOCIATION.

A recent issue of the *Pharmazeutische Weeklad* (Holland) contains an article by **Dr. John C. Krantz, Jr.,** on the "Assay of Amyl Nitrite."

Prof. John Jacob Abel, of Johns Hopkins, received the honorary degree of L.L.D. from Aberdeen University (England) on July 6th. In presenting him for capping, the Principal, Sir George Adam Smith, described Dr. Abel as one of the greatest of living pharmacologists.

SOCIETIES AND COLLEGES.

CONFERENCE OF PHARMACEUTICAL LAW ENFORCEMENT OFFICIALS.

The fourth annual Conference of Pharmaceutical Law Enforcement Officials will be held at Toronto, Canada, August 25th–26th, in connection with the 80th annual meeting of the AMERICAN PHARMACEUTICAL ASSOCIATION.

The Conference was instituted for the purpose of bringing enforcement officials together so that enforcement policies and procedure, pharmaceutical legislation, court decisions and other matters of interest to the group might be studied and discussed. The Conference really was the outcome of the belief held by many thoughtful observers that an adequate appreciation and observance of the law are essential to the development and security of the pharmaceutical profession. These annual gatherings are devoted to an earnest consideration of practical enforcement difficulties as they arise in the several states of the union so that a policy, more or less expressive of national needs, may be worked out and applied.

An important feature of the program will be the consideration of narcotic laws, National and State.

The following is part of the program:

"Discussion of Recent Pharmaceutical Legislation, M. N. Ford, Ohio.

"Pharmaceutical Legislation in New Jersey," Robt. P. Fischelis, New Jersey.

"The Recent California Case Upholding the Pharmacy Law," John Culley, California, W. Bruce Philip, District of Columbia.

"A Review of the Operation of the Pennsylvania Pharmacy Law in 1931," John M. Woodside, Pennsylvania.

"The Enforcement of the Illinois Pharmacy Act," J. E. Edwards, Illinois.

"Collaboration between State and Federal Agencies in the Enforcement of Narcotic Laws," Alfred L. Tennyson, Legal Advisor, H. T. Nugent, Field Supervisor, Federal Bureau of Narcotics, District of Columbia. Harold V. Smith, Chief, Bureau Narcotic Drug Control, Pennsylvania, will discuss this question from the State viewpoint.

"U. S. P. and N. F. Revision and Pharmacy Law Enforcement," Discussion opened by Robt. P. Fischelis, New Jersey, E. Fullerton Cook, Pennsylvania, Robt. L. Swain, Maryland, etc.

Mr. Thomas Marns, Chairman, Committee on Law Enforcement, Pharmaceutical Society of Great Britain, will address the Conference on Law Enforcement Problems in England.

OFFICERS OF ARKANSAS PHARMACEUTICAL ASSOCIATION.

Brief comments have been made heretofore of the Golden Anniversary meeting of Arkansas Pharmaceutical Association. The following officers were elected for the ensuing year: *President*, L. K. Snodgrass, Little Rock; *First Vice-President*, Royce B. Wilkins, Conway; *Second Vice-President*, Herbert F. Garner, Paragould; *Secretary*, E. D. Oslin; *Treasurer*, J. K. Poch—reëlected.

CONNECTICUT PHARMACEUTICAL ASSOCIATION.

H. M. Lerou, the reporting secretary of the Connecticut Board of Pharmacy, was presented at a Veterans' dinner with a beautiful electric table lamp, and the Association presented him with a sterling console set. The former was presented by President Beirne and the Veterans' gift by Past-President George A. Rapport.

The following officers were elected: *President*, John F. Blackall, Bristol; *First Vice-President*, Frank F. Murphy, Manchester; *Second Vice-President*, Wm. C. Coughlin, West Haven; *Third Vice-President*, Wm. J. Cody, Bridgeport; *Secretary-Treasurer*, P. J. Garvin.

The Association by resolution recommended John Goode for president of the N. A. R. D.

The entire pharmacy commission expects to go to the AMERICAN PHARMACEUTICAL ASSOCIATION convention in Toronto. This is keeping intact their 100% record for attendance.

Louis Montanaro, of New Haven, was elected president of the State Board of Pharmacy and **Hugh P. Beirne,** president of the Connecticut Pharmaceutical Association, was appointed member of the Connecticut Board, succeeding **H. M. Lerou** who had completed fifteen years of service. The latter was presented by his colleagues with a handsome desk set.

Inadvertently in revising the Connecticut roster the names of Charles Gustafson, Jr., Hartford, and C. Thurston Gilbert, Noroton, were omitted, but included in this issue of the JOURNAL.

MASSACHUSETTS PHARMACEUTICAL ASSOCIATION.

Massachusetts had a registration of over 500; among the speakers of the convention were President Walter D. Adams of the A. PH. A., C. Fred Wright of the N. A. R. D., and R. D. Keim. Among the former presidents of the Association present at the meeting were: Messrs. Finneran, Packard, Jones, Heinritz, Shea, Harring and Burke. These were introduced to the convention by President Sisson. President and Mrs. Walter D. Adams were guests of honor of the Association.

Resolutions were adopted calling attention of the Committee on U. S. P. Revision: 1. "Pilocarpine and Atropine Be Tested Biologically;" 2. "Distributors' Defence Movement" was endorsed.

It was recommended that physicians do not dispense their own medicines.

Mr. and Mrs. I. Shurtleff of New Bedford attended the meeting. This is the 50th year of membership of Mr. Shurtleff.

The following officers were elected for the ensuing year: *President*, Charles H. Brown, Fall River; *First Vice-President*, Martin Adamo, Boston; *Second Vice-President*, Joseph H. Martin, Malden; *Secretary*, Carl G. A. Harring, Newton Center; *Treasurer*, Lyman W. Griffin, Allston.

KENTUCKY PHARMACEUTICAL ASSOCIATION OPPOSES REGISTRATION OF ASSISTANT PHARMACISTS WITHOUT EXAMINATION.

The registration of Assistant Pharmacists was a subject of discussion at the recent meeting of Kentucky Pharmaceutical Association. The Association is not in favor of registering Assistants, *i. e.*—to have the Board issue Assistant Pharmacists certificates; also voted that present Assistants should not be granted full registration without passing a satisfactory examination. The entire subject was referred to the Executive Committee to confer with the Kentucky Board of Pharmacy. Prof. Gordon L. Curry urged a large attendance at the meeting of the AMERICAN PHARMACEUTICAL ASSOCIATION, in extending its greetings. The following officers were elected for the ensuing year: *President*, O. L. Dyer, Burnside; *First Vice-President*, Harry Frankel, Louisville; *Second Vice-President*, C. E. Montgomery, Owensboro; *Secretary*, J. W. Gayle, Frankfort; *Assistant Secretary*, R. A. Gayle, Frankfort; *Treasurer*, Wm. J. Johnston, Mayfield.

PENNSYLVANIA PHARMACEUTICAL ASSOCIATION.

The 55th annual meeting of the Pennsylvania Pharmaceutical Association was held at South Mountain Manor, Wernersville, Pa., June 21st–23rd, with a registration of over 400.

The following officers were elected for the ensuing year: *President*, John C. Walton, Philadelphia; *First Vice-President*, Robert R. Gaw, Pittsburgh; *Second Vice-President*, Ray G. Anderson, Philadelphia; *Secretary-Treasurer*, J. B. Pilchard, Harrisburg. *Members of the Executive Committee: Chairman*, F. J. Blumenschein, Uniontown; C. Leonard O'Connell, Pittsburgh; Henry Brown, Scranton.

Among the speakers of the convention were: E. Fullerton Cook, on "Approved Materia Medica of To-day;" "Natural Resources of Pennsylvania," Thomas C. Mirkel, Director of the State Publicity Bureau; Pennsylvania State Chamber of Commerce; "How the Druggists Research Bureau Is Helping Retail Druggists Get More Profits from Other Stores," Paul C. Olsen. Former president, C. Leonard O'Connell, Pittsburgh College of Pharmacy, spoke on "Application of Information Obtained from St. Louis Drug Store Survey." President Brown's address was timely and instructive and dealt largely with education, organization and legislation.

Among the resolutions adopted were: That a booth and display of U. S. P. and N. F. preparations be made an annual event at the state medical convention with effective coöperation by the county group.

That the Association recommend and encourage legislation to the effect that the Department of Public Instruction accept applicants for food, milk and other important health inspectorship only under condition that the applicants have shown themselves trained to be able to cope with the exacting duties.

A committee is to be appointed to make a study of mercantile tax.

An organization of Pennsylvania pharmacognosists was formed with the following as officers: *President*, William J. Stoneback; *Vice-President*, L. K. Darbaker; *Secretary*, Edward P. Claus; *Treasurer*, Frank H. Eby.

VERMONT PHARMACEUTICAL ASSOCIATION.

Dean Theodore J. Bradley gave an interesting address on Porto Rico illustrated by colored lantern slides. The Dean had visited in

Porto Rico last winter. A complimentary luncheon was given to Dean Bradley.

Prof. Heber W. Youngken gave an illustrated paper on "Psyllium Seed."

The following officers were elected: *President*, L. W. Leonard, Randolph; *Vice-Presidents*, H. E. Coleman, Barre; Lawrence McShane, Bristol; George E. Donovan, Fair Haven; *Secretary-Treasurer*, Welcome B. Eastman, St. Johnsbury.

Resolutions were adopted favoring return to botanical drugs and favoring cultivation of drug-yielding plants. The Association will meet next year at Lake Bomaseen in Castleton.

LEGAL AND LEGISLATIVE.

SECTIONS OF EDUCATION LAW, NEW YORK, HELD UNCONSTITUTIONAL. (NEW YORK OWNERSHIP LAW.)

APPEAL TO BE TAKEN.

New York Appellate Division has handed down a decision which declares Sections 1354 and 1362 of the Education Law unconstitutional; these sections designate that the owner of a pharmacy must be a licensed pharmacist—Hyman Pratter had been denied a license to open a drug store, because he was not a licensed pharmacist. The judgment in favor of Pratter was based on the Ligget case, the court holding that it found no facts or circumstances of substance differentiating the two cases. An appeal will be taken to the Court of Appeals.

CUBAN PHARMACY BILL.

The Cuban Senate and House of Representatives have acted favorably on the following Bill for a pharmacy law, which awaits the consideration of the President:

ARTICLE I. To exercise the profession of pharmacist in Cuba, in addition to the requirements now necessary, it is required that such person be a Cuban citizen and that as an associate he belong to the National Pharmaceutical Association, either directly, or as a member of any one of the provincial or local Pharmaceutical Associations now in existence within the territory of the Republic, provided, however, that the latter maintain ties or relationships with the former. These ties or relationships of dependency are fixed or defined in the rules and regulations that will be issued for the purpose of this law.

ARTICLE II. It shall devolve upon the National Pharmaceutical Association to furnish, free of charge, any information desired by the Courts of Justice and by other organizations of the State, in reference to problems of a technical nature that may arise, and required by the Courts and organizations referred to for their enlightenment, approval or examination.

ARTICLE III. For drafting the rules and regulations, the Executive shall designate a commission to be composed of the Secretary of the Board of Health, the General Inspector of Pharmacy, or his deputy and three members of the National Pharmaceutical Association, nominated to that effect by its Managing Committee. The rules and regulations will have to be completed within the sixty days following the promulgation of this law.

ARTICLE IV. All laws, regulations and any other provisions now in force and in opposition to the execution of this law are hereby canceled.

PHARMACY LAW UNDER CONSIDERATION IN PORTO RICO.

An editorial in *Revista Farmaceutica de Puerto Rico* is abstracted in the following:

The pharmaceutical profession has brought to the attention of the legislature the need of legislation regulating the practice of Pharmacy. The Pharmaceutical Association and the Medical Association of Porto Rico have endorsed the movement and have written directly to the Governor of Porto Rico, the Speaker of the House of Representatives, and the president of the Senate.

The letter from Secretary Kelly, of the AMERICAN PHARMACEUTICAL ASSOCIATION, dated March 29, 1932, is reproduced and followed by a letter from Secretary H. C. Christensen, of the National Association of Retail Druggists. Christensen's letter acknowledges receipt of a copy of the measure "P. de la C 101" introduced in the House of Representatives of Porto Rico, on February 19, 1932, and expresses the hope that the bill before the legislature will be enacted before the legislature adjourns. He points out that the present law is not sufficient and that the new law will protect the profession and the public; will lead to better care being taken of prescriptions and will place responsibility in the hands of the profession, with power to act.

He goes on to state that only constant supervision, and punishment of offenders against the

law will bring about adequate protection of the public. He mentions that certain states in the United States have similar laws and that the Supreme Court of the United States in the case of L. K. Liggett *vs.* T. J. Baldridge, Prosecutor General of Pennsylvania, *et al.*, No. 34, recognized the necessity of enacting laws governing the practice of Pharmacy.

The editorial mentions that no copy of the letter of the Medical Association of Porto Rico is at hand, but that they were officially informed by its president, Dr. Rafael Bernabe, that it had been sent.

The need of the legislation is indicated. It is pointed out, however, that certain individuals indirectly connected with the pharmacy are actively opposing the measure.

The remainder of the editorial deals with the steps that are being taken by the legislature and the progress that is being made.

STATE LEGISLATION.

Two states have abandoned proposals to add state taxes to the sales of drug store articles which already carry Federal imposts, while a third, Pennsylvania, is understood to be considering such a proposal. Louisiana had been considering a ten per cent tax on patent and proprietary remedies. The bill which would have brought this new levy down upon the drug store was introduced into the House, went into committee, and from there returned with an unfavorable report. It was then withdrawn.

There had been considerable talk among New Jersey politicians and business men concerning a "final sale" tax of two per cent on cosmetics. A bill providing for such a tax was brought into the legislature and for a while the press carried reports of growing sentiment among industrial and state leaders in favor of the measure. The proposal has been abandoned and legislature has adjourned.

Other state legislation now pending which will affect the drug trade follows: In Indiana a special session began on July 7th to consider taxes. Louisiana House Bill 15 proposes an amendment to the Constitution of Louisiana by providing that an income tax not to exceed ten per cent may be levied for state purposes. The present limit is three per cent. This bill has passed the House. House Bill 242 levies a graduated gross sales tax, from one-tenth of one per centum under $100,000 to two per cent on $1,000,000 up.

House Bill 735, placing drugs, chemicals and poisons in registered druggists' hands was defeated.

INHALANTS MUST STATE ALCOHOL CONTENT.

FOOD AND DRUGS ACT.

Misbranding—Failure of label to state alcoholic content—Inhalant as drug within meaning of act—Application of provision for statement of alcoholic content to preparation not used internally—Constitutionality of statute.

A preparation intended for use as an inhalant in the treatment of head colds by placing a drop or two in the center of a folded handkerchief and inhaling the vapor therefrom, is a "drug" within the meaning of the Federal Food and Drugs Act (21 U. S. C. 10) which defines the term "drug" to include any substance "intended to be used for the cure, mitigation or prevention of disease of men or other animals." A head or common cold is a "disease" within the statute. A provision of the statute defining misbranding to include the failure to state on the label on the package the alcoholic content of the preparation is applicable to such preparation, although an inhalant which cannot be taken internally. The statute so construed is not void on the theory that the alcoholic content does not render it harmful to the public health.—United States *vs.* 11 Cartons, etc. (D. C., D. Md.)—7 *U. S. Daily*, 830, July 2, 1932.

NARCOTICS.

FORFEITURE OF AUTOMOBILES FOR TRANSPORTATION—CONSTITUTIONALITY OF STATUTE—DUE PROCESS OF LAW—FAILURE TO PROVIDE FOR NOTICE TO OWNER.

A provision of the California Narcotic Law for the forfeiture of automobiles used in transporting narcotics is unconstitutional because violative of the due process of law clauses of the State and Federal constitutions for failure to provide for a notice to the owner and to accord the owner a hearing prior to the forfeiture. The statute provides for the forfeiture of an automobile so used regardless of the guilt or innocence of the owner. The fact that the conditional buyer of an automobile in possession thereof at the time of its seizure was given notice and accorded a hearing did not satisfy the requirements of due process of law as to a finance company holding the title, on the theory that the interest of the company was subject to forfeiture if pur-

chaser's interest was subject thereto and that a forfeiture notice to the company would therefore have been an idle act.

The statute is not valid on the theory that a requirement of notice is implied, in the absence of a provision expressly dispensing with notice, from the fact that it is a constitutional requirement. Some authorities so hold but the California rule requires a statute to provide for notice which is essential to due process of law and a provision therefor will not be implied from the fact that the statute does not undertake to dispense therewith.—*People of California vs. Broad et al.; Calif. Sup. Cit., No. S. F.* 14513, July 1, 1932.

ADDITIONAL EDITORIAL NOTES AND OTHER ITEMS.

Dr. C. Leonard O'Connell, for a number of years a member of the faculty of Pittsburgh College of Pharmacy, and for the past two years Associate Dean, has been elected Dean of the School of Pharmacy of the University. The Dean is well and favorably known for his activities in the State Association and also the AMERICAN PHARMACEUTICAL ASSOCIATION.

Dr. Julius A. Koch, Dean of the School of Pharmacy for forty-one years, and member of the faculty for fifty years, has been elected Dean Emeritus.

INCOMPATIBLES.

H. E. Benfield, chairman of the Policy Committee of The Academy of Pharmacy and Northern Ohio Branch of the AMERICAN PHARMACEUTICAL ASSOCIATION, has prepared the following list of incompatibilities for physicians.

1. **Acid-reacting substances,** or preparations containing them, like Fluidextracts of Ipecac or Ergot, Syrups of Orange or Squill, Solutions of Ammonium Acetate or Iron Chloride should not be prescribed with alkaline substances or preparations containing them, such as those of Rhubarb, Senega and Eriodictyon. Licorice is rendered less useful by acids.

2. **Acetylsalicylic Acid** (aspirin) is decomposed in aqueous solutions and should not be prescribed in such form. Alkalies in general hasten the decomposition of aspirin. Alkali acetates and citrates render Acetylsalicylic Acid more soluble but **do not** prevent its decomposition.

3. **Epinephrine** (adrenalin) is so sensitive to change that it should be prescribed in quantities sufficient for only a few days' use when mixed with other substances.

4. **Bismuth Subnitrate,** because of hydrolization, slowly liberates carbon dioxide from carbonates and bicarbonates in aqueous preparations.

5. All **silver salts** are reduced by light, organic matter or other reducing agents and should be prescribed accordingly. Colloidal silver solutions should be prescribed in quantities sufficient for only a few days' use, since they quickly deteriorate.

6. **Elixirs** and other solutions of **Barbital** and its derivatives like Phenobarbital (luminal) usually contain the sodium salt of these compounds which makes them more quickly active. Hence, they should not be prescribed with acid substances, which tend to precipitate the active ingredient.

7. **Pepsin** is useless in alkaline media; likewise **pancreatin** in acid media. Hence the desirability of not prescribing them with opposing preparations.

8. Calomel or other **mercurous** salts are dangerous when prescribed with bromides, or iodides, since the highly toxic Mercuric Bromide, or Mercuric Iodide, is formed.

9. **Ferric salts** and **iodides** are incompatible, since free iodine is liberated, due to oxidation. The presence of an alkali citrate prevents this. Hence, tincture of ferric citrochloride is preferable to the plain tincture of ferric chloride.

10. In general, **alkaloidal salts** are precipitated by alkalies, iodine and tannin preparations (including many tinctures and fluidextracts). It is to be presumed, however, that the skilful pharmacist will exercise his prerogatives and overcome these difficulties by the correct use of such pharmaceutical adjuncts as alcohol, glycerin, mucilage and syrup.

The following formula for a modified Whitfield's Ointment has also been submitted for consideration by physicians.

Acidi salicylic		2	4 (gr. XL)
Acidi benzoici		3	6 (ʒi)
Adipis lanæ			
Petrolati	aa.		
	q. s. ad	60	0 (ʒii)

PRICE-CUTTING PENALIZED IN ENGLAND.

HIGH COURT OF JUSTICE: CHANCERY DIVISION PRICE-CUTTING RESTRAINED. (GREAT BRITAIN). P. A. T. A. (Manufacturers' Section) *vs.* Sunshine Pharmacy.

On June 21st Mr. Justice Manham had before him a motion for an interim injunction in

an action brought by The British Drug Houses, Ltd., J. Grossmith and Sons, Co., Ltd., on behalf of themselves and all other members of the Manufacturers' Section of the Proprietary Articles Trade Association against the Sunshine Pharmacy, Ltd., and Dora Earle.

Mr. Trevor Watson, K. C., and Mr. H. Glyn-Jones (instructed by Mr. Cyril H. Kirby) appeared for the plaintiffs, and Mr. H. A. Christie for the defendants.

Mr. Trevor Watson announced that the case had been settled on the footing that the motion should be treated as the trial of the action and the defendants consenting to a perpetual injunction in the terms of the writ, and paying £25 as damages and the taxed costs. The terms of the injunction were that the defendants and their servants and agents would be restrained from selling or supplying directly or indirectly any goods manufactured or sold by any of the plaintiffs, and named in the Protected List of the Proprietary Articles Trade Association, at lower prices than the minimum retail prices set out in the Protected List, and from selling or supplying any such goods otherwise than in a shop in the ordinary course of retail business, and from selling or supplying any such goods to the D. and L. Drug Stores, Ltd., or to Sidney Egelnick.

Mr. Christie assented to the order asked for, and his Lordship said there would be judgment, by consent, for the plaintiffs, in the terms agreed.—From the *Journal and Pharmacist.*

STATUS OF PHARMACOPŒIAS IN VARIOUS COUNTRIES.

The National Pharmaceutical Institute, a federation of Belgian pharmaceutical organizations—a federation given legal recognition in Belgium—is seeking information on pharmacopœias of different countries from associations belonging to the International Pharmaceutical Federation of which the AMERICAN PHARMACEUTICAL ASSOCIATION is a member. A questionnaire has been issued dealing with the functions, organization and authority.

DISSERTATIONS, BULLETINS AND THESES RECEIVED.

We are indebted to the Smithsonian Institution for bulletins on various subjects, as issued.

Acknowledgment is made of the following, with thanks:

Bulletin of the University of Wisconsin—"Phytochemistry," by Edward Kremers and colaborers.—"II, Chemical Properties of Hydrocarbons." "Beiträge zur Kenntnis der Inhalts-Bestandteile des Rhabarbers (Constituents of Rhubarb)."—An inaugural dissertation by Eduard Siegrist, Apotheker in Basel, for the Doctor's degree. Prepared under direction of Dr. H. Zörnig and Dr. P. Casparis. 70 pages.

"Zur Stereochemie der China-Alkaloide." (Stereochemistry of Cinchona alkaloids), Inaugural dissertation by Nuhim Fidelman, Capresti, Roumania, for the Doctor's degree at University of Basel. Prepared under direction of Dr. H. Emde, Dr. H. Zörnig and Dr. P. Casparis. 60 pages.

Reprints have been received of the following through Prof. J. Stamm from the Pharmacognostic Institute of the University of Tartu (Dorpat): Further contributions of his methods for quantitative determinations of the etherial oils in drugs. The foregoing subjects are by Eino Tikkanen, *Mag. Phil.* "Determination by Stamm's Method by Use of Butyrometer, by Apothecary Ernst Jägerhorn. By the same author—"Determinations of Linseed Oil," employing the diphenylcarbazid reaction, Stamm and Fellenberg. Several reprints reporting on ether determinations, phenolphthalein as reagent. "Valuation of Saffron," Stamm and Tomingas. Present status of the study of Male Fern, administration, etc.

Year Book of Therapeutics, Boerhaave. Twelfth edition issued by *Natuur*—en Geneeskundige Vennootschap, Antwerp.—A bibliography and directory.

NATIONAL HOLIDAY FOR VETERAN DRUGGISTS.

S. L. Hilton, Washington, D. C., communicates that at the annual joint luncheon of the District of Columbia Veteran Druggists' Association and the Baltimore Veteran Druggists' Association, held recently, President Affleck suggested that a national day of celebration be inaugurated to be known as the Veteran Druggists' May Day celebration to be the third Thursday of May.

This suggestion was well supported by all present and was unanimously approved by the ladies who were guests at the outing.

It was further suggested that the secretaries of each association advise the drug journals, requesting the publication of the idea, so that all veteran druggists' associations might join in this movement, thereby making it an annual national holiday.